



USER MANUAL

AUTOLOG 3000 and PICAS Touch

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1 Introduction

The Autolog 3000 concept is based upon the use of fully autonomously functioning measuring cards. These cards will condition the inputs, convert them to digital values, scale those values and buffer the measured values until they are transmitted to the controlling system.

The use of these universal modules makes it possible to configure “systems” from 6-channel boxes up till multiple 19" racks with 96 channels each. In this way, larger and de-centralized systems can be easily set up.

With this Autolog 3000 concept, Peekel Instruments offers its more than half a century worth of experience to today's high-accuracy computerized electronic measuring technology.

1.1 Housings

Depending on the number of cards needed, one of the following housings can be chosen:

- HCA3001: table top housing in which 1 card can be mounted
- HCA3003: table top housing in which 3 cards can be mounted
- HCA3004: table top housing in which 3 cards can be mounted + a PB3100
- HCA3008: table top housing in which 8 cards can be mounted
- HCA3016: 19" rack or table top housing in which 16 cards can be mounted
- PICAS Touch: table top housing with touchscreen in which 3 cards + a PB3100 communication card can be mounted

1.2 HCA3001 housing



This table top housing can a single card. The input connectors of the cards are located at the back side of the housing. The front side (shown) contains a SYNC connector and two combined CAN-bus/power connectors (on the right). The 3 pins in the middle are the CAN lines and cable screen. On pins 1 and 5 the power supply can be connected.

The HCA3001 needs an external power supply. The standard delivered external power supply is a little tabletop housing. The 24VDC power connector can be plugged directly into the HCA3001 housing.

Beware: this small external 24V power supply can supply power to max. 3 cards!

1.3 HCA3003 housing

This table top housing can hold up to 3 cards. The input connectors of the cards are located at the front side of the housing. On the left side of the cards, the combined CAN-bus/power connectors are mounted. The 3 pins in the middle are the CAN lines and cable screen.

On pins 1 and 5 the power supply can be connected.



The HCA3003 can be used with an (optional) internal or an external power supply. The standard delivered external power supply is a little tabletop housing. The 24VDC power connector can be plugged directly into the Autolog 3000-3 housing.

Beware: this small external 24V power supply can supply power to max. 3 cards!

When the HCA3003 is used with an internal power supply, a different panel is mounted on the rear side of the housing

Although the 24VDC is generated inside the HCA3003, **this supply is not available at the front side connectors**. It is not possible to use the internal power supply as power source for other CAN bus devices or sensors.

It is possible to use an external; power supply (9-36VDC) as the power source for this system. To use this power supply the internal power supply must not be connected to the mains.



At the rear panel a special “SYNC” connector is present. On this connector a sync signal is present with a frequency of 1 kHz. This is a RS485 level signal:

pin	signal
1	Sync-h
2	Sync-l

This sync signal is used to synchronize all the channels which are converted at a speed of 1 kHz. All these signals will be converted at exactly the same moment on the positive edge of the sync signal.



1.4 HCA3004 / PICAS Touch housing

This table top housing can hold up to 3 measurement cards, and a single PB3100 communication card. The input connectors of the cards are located at the back side of the housing. The PB3100 card at the bottom provides communication through Ethernet and USB, as well as several other options like SD-card storage and synchronisation.



The Picas Touch housing (HCA3004-TSD) includes a 7 inch full-color touch screen display, the HCA3004 housing has a blank front panel.

The PB3100 includes an external power supply connector. **To use this external power supply (9...36 VDC) the internal power supply must not be connected to the mains.**

1.5 HCA3008 housing

This table top housing can hold 1 to 8 cards. Input connectors of the cards are located at the front side of the housing.



At the rear side the combined CAN-bus/power connectors and "SYNC" connector are present.

To use this external power supply (9...36 VDC) the internal power supply must not be connected to the mains.



1.6 HCA3016 housing

This 19" rack mounting housing can hold up to 16 cards. Input connectors of the cards are located at the front side of the housing.

At the rear side the combined CAN-bus/power connectors and "SYNC" connector are present.

To use this external power supply (9...36 VDC) the internal power supply must not be connected to the mains.

1.7 Ethernet connection (AUTOLOG 3000 to PC)

The control and communication card PB3100 with Ethernet connection is available for housings HCA3004 (required), HCA3008 (optional) and HCA3016 (required). This controller card uses one slot and has both USB and Ethernet connections to communicate with a PC. Ethernet is the preferred and most reliable communication mode for this card; for connecting to an Ethernet network please refer to chapter 2.6 and on.

For USB driver installation: see chapter 1.9.

The PB3100 also has internal flash memory and an SD-Card slot for storing measurement values (for details refer to chapter 3.7).

Other connectors are available for synchronizing multiple housings as well as time synchronization with an external source.

1.8 CAN-bus connection (AUTOLOG 3000 to PC)

To configure the AUTOLOG 3000, as well as to store measured data, it must be connected to a PC. Depending on the type of Autolog 3000 housing, this connection can be made through CAN-bus, USB (option) or Ethernet (option ETH).

The CAN-bus has the advantage that multiple cards and/or housings can be connected in a decentralized way to a single bus. It is important to note that the CAN-bus speed is limited to 1 MBit/s, which equals about 7000 measurement values per second (for details: see specification of the CAN-bus cable).

Because the CAN-bus cannot be connected directly to a standard PC, an external converter is used. By default a CAN/USB converter is used, but there are other options available like converters for CAN/Ethernet or CAN/WLAN (more information on request). Every converter has a 9-pins D-Sub connector for connecting the CAN-cable.

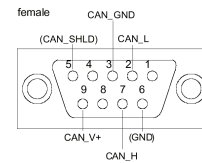
1.8.1 CAN communication cable

A cable is always delivered to connect the CAN/USB interface to the AUTOLOG 3000. The standard cable length is 2 meter.



5-----1

front view



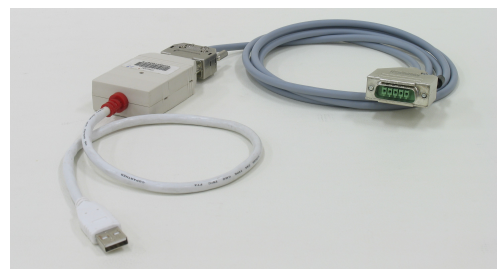
Autolog 3000		Signal description	Sub D9 female
1	-	0V	(yellow) 3
2	CL	CAN L	(white) 2
3		screen	Connector house
4	CH	CAN H	(brown) 7
5	+	+9-36V	

In the SubD9 connector a 120 ohm resistor is mounted over the CAN L and CAN H line. With this resistor the CAN bus is terminated at this end.

The connector used for the connection to the Autolog 3000 is made by Phoenix, type PSC 1.5/5-F. The cable housing is SCT-D-SUB 15-KG of Phoenix

On the other end of the cable a SubD9 connector is mounted. This connector must be connected to the CAN/USB converter.

It should **not** be connected directly to the serial COM-port of a PC!!



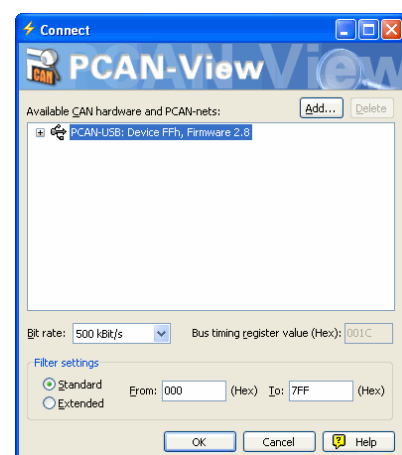
1.8.2 Multiple CAN busses on a single PC

When using the PCAN-USB converter to connect the CAN bus to a PC, it is possible to use multiple PCAN-USB converters (up to a theoretical maximum of 8) to drive multiple CAN busses. To make this work, each PCAN-USB converter must first be assigned a unique **Device ID**. This ID can be assigned using the PCAN-View software, which can be installed on the PC together with the PCAN-USB driver. You can download the latest driver from the support section of www.peak-system.com.

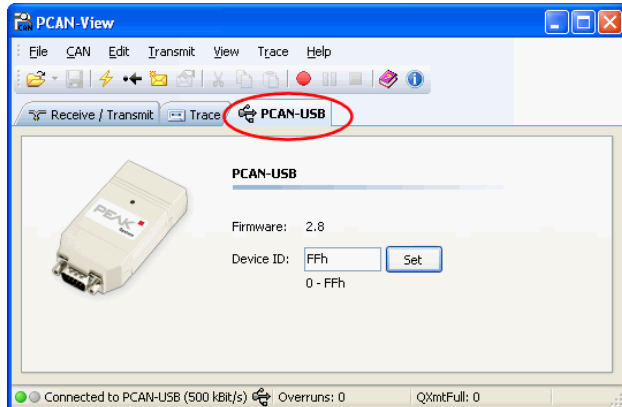
Tip: First install the driver, then connect the PCAN-USB converter to the PC.

To configure the Device ID, start the PcanView software. In the start window, select the desired converter and confirm with “OK”.

Then switch to the tab PCAN-USB to set the new Device ID. The default Device ID is always FFh. When using multiple converters, it is advisable to use



addresses 1h, 2h, ... By clicking “Set”, the new Device ID is written to the converter.



1.8.3 Autolog 3000 external power supply cable

The Autolog 3000 can be used with an internal (option) or an external power supply. The standard external power supply is a tabletop housing. The 24VDC power connector can be plugged directly into the Autolog 3000-3 housing.



5----1

Autolog 3000		description	MPE-C036-24
1	Power supply	0V	screen
2	CL	CAN L	
3		screen	
4	CH	CAN H	
5	Power supply	+9-36V	core

Note: the MPE-C036-24 is the standard delivered external power supply with an Autolog3000-3. This power supply has a small coax cable connected to it.

1.8.4 Autolog 3000 Interlink cable

When more Autolog 3000 systems are used, the same CAN bus can be used to connect those systems to 1 PC. Remember that the maximum throughput of the CAN bus depends on the CAN bus speed and is 7000 values/second at a data rate of 1Mbit/second.

When the Interlink cable is used to connect 2 Autolog 3000 systems, 1 CAN bus connector on each Autolog 3000 systems is used for this connection. Only 1 CAN bus connector is now available for the connection to the CAN-USB interface and to connect the power to the Autolog3000 system. In this situation the standard cables cannot be used. These 2 standard

cables must now be reworked in such a way that both cables (CAN bus and power) are connected to 1 CAN bus connector.

Beware of the following points when connecting Autolog 3000 systems in such a way:

- The external power supply should be able to supply about 12W per card. **The MPE-CO36-24 will supply power for max. 3 cards!**
- In some cases it may not be possible to use the supplied cables, for instance when CAN-signal and power supply are separate. It may be necessary to combine those on a single connector.
- The maximum data rate on a CAN-bus depends on the total length of the bus-cable. For more details, see the specifications of this cable (below).

1.9 USB connection (AUTOLOG 3000 to PC)

The Autolog 3000 system can be ordered with an USB option. An extra USB interface is build in the housing. An extra USB type B connector is available on the outside of the housing. A direct connection to a PC can be made through this USB connector.



Autolog 3000-3 with USB option



Autolog 3000-8 with USB option

The USB V1.1 is used with a data rate of 12Mbps.

Through this USB interface a maximum of 48000 measured values per second can be sent to the PC.

The USB interface can not be used simultaneously with the CAN bus. When the system is connected to the PC through the USB bus, no communication with the CAN bus is allowed. The CAN bus may be used after power-on with no connection of the USB connector.

1.9.1 USB interface and thermocouple measurement

Special care must be taken when thermocouples are measured with the use of the USB interface.

For a thermocouple measurement cold junction compensation must be used. The compensation is done through the measurement of the temperature of the place where the thermocouple wires are connected to normal wiring or connection terminals. This CJC measurement is done with the use of a PT100 element, which must be connected to an input of the Autolog 3000 system. To make it possible that this CJC temperature can also be used as a CJC for thermocouples measured on other input cards in the same Autolog 3000 system, those other cards will receive this CJC temperature through the CAN bus. The maximum transfer rate of the CJC temperature will be 5 Hz. To use the CAN bus a termination resistor of 120 ohm must be present at power-on.

The CJC will not function when this termination resistor on the CAN is not present!!!

1.9.2 Multiple Systems on 1 PC

More Autolog 3000 systems can be connected to 1 PC through different USB ports. Remember that multiple USB ports on a PC are connected through an internal HUB and will have a total data rate of 12 Mbps (up to 48000 measurement values/sec for a single device, up to 60000 values for multiple devices).

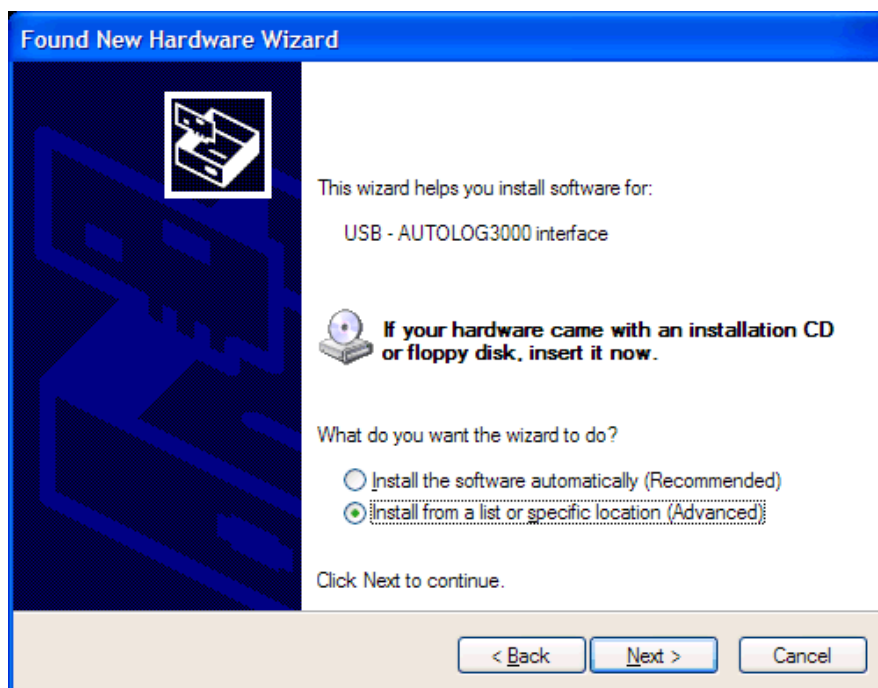
The maximum throughput for multiple Autolog 3000 systems connected to different USB-busses (not going through a single internal or external hub) depends on several PC-dependent factors and should be tested for each specific case.

1.9.3 USB Driver Installation (Windows XP)

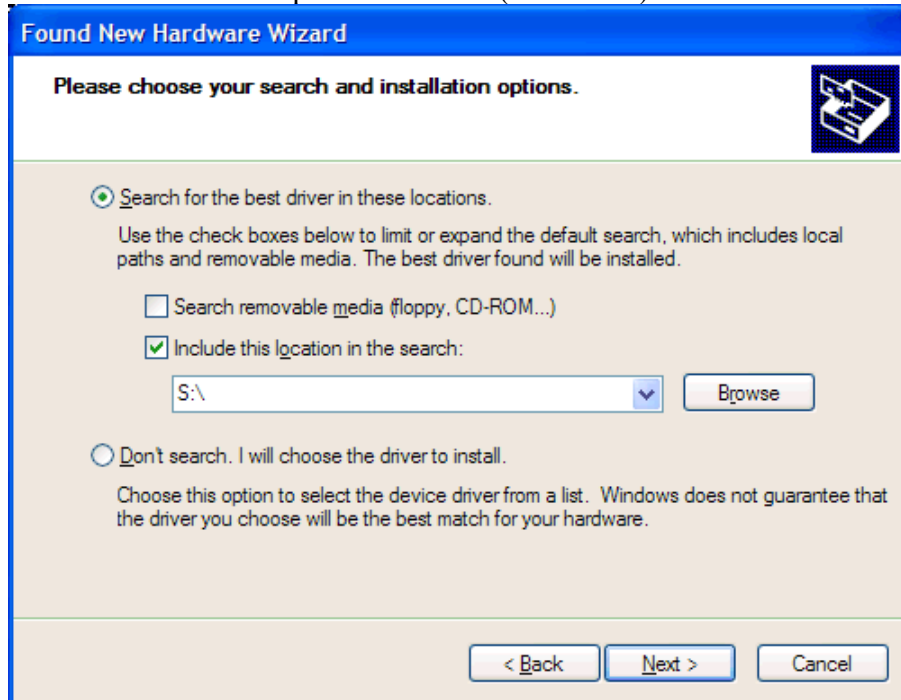
Start the PC, connect the Autolog 3000 to the PC using a USB cable and switch on the Autolog 3000. Windows will automatically detect a new device named 'USB – Autolog 3000' and show the following dialog:



Select the 'No, not this time' option and click 'Next' to continue.



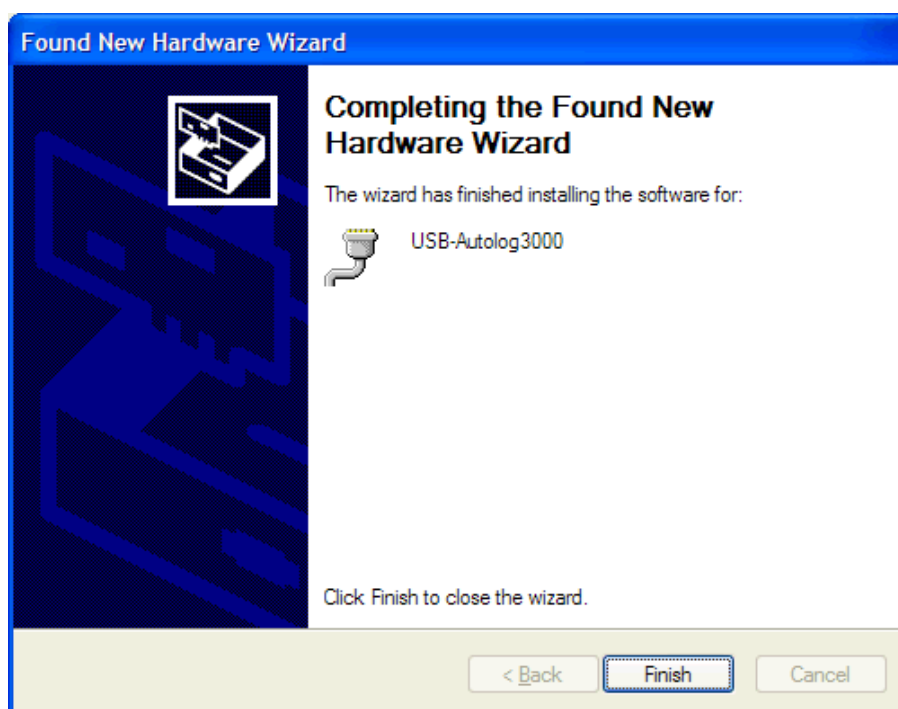
Now select 'Install from a list of specific location (Advanced)' and click 'Next'.



Choose 'Search for the best driver...' and check the 'Include this location in the search' box. Then browse for the location of the driver, which can be found in the root directory of the installation CD. Click 'Next' to continue.



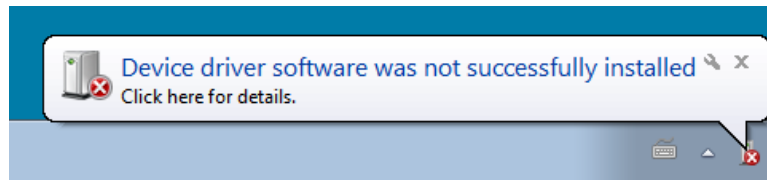
Windows XP will warn about 'Windows Logo testing', click 'Continue Anyway' to complete the installation.



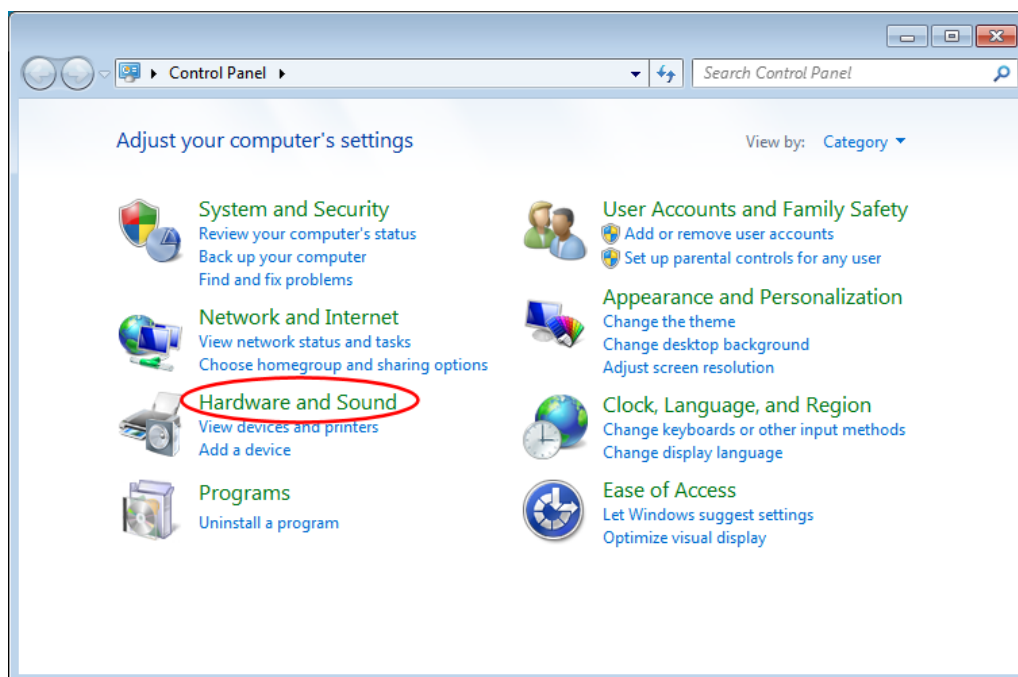
The Autolog 3000 device driver is now installed and can be found as a new COM-port in the system.

1.9.4 USB Driver Installation (Windows 7)

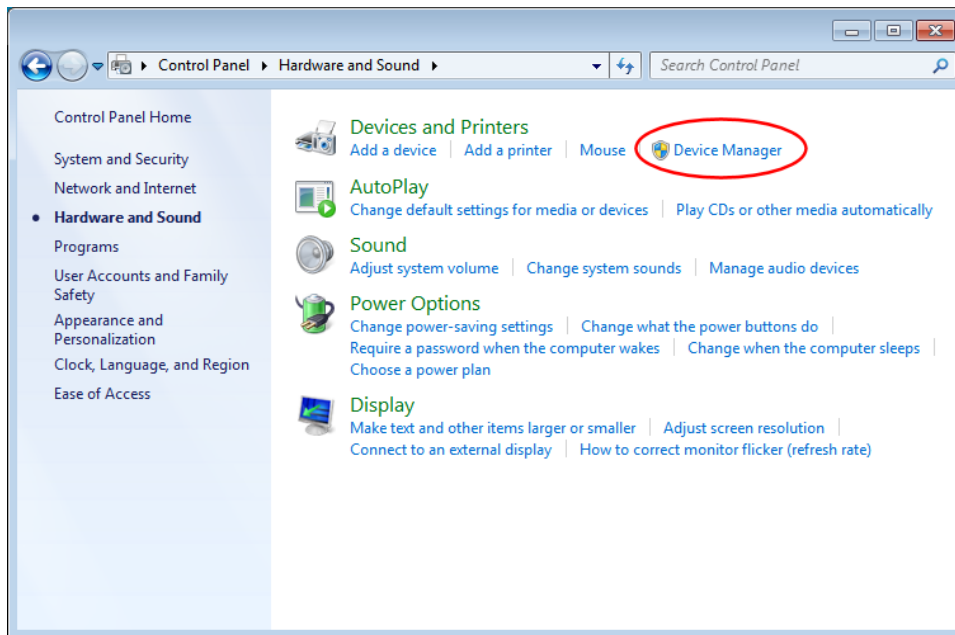
Start the PC, connect the Autolog 3000 to the PC using a USB cable and switch on the device. Windows will automatically detect a new device and try to install a driver for it.



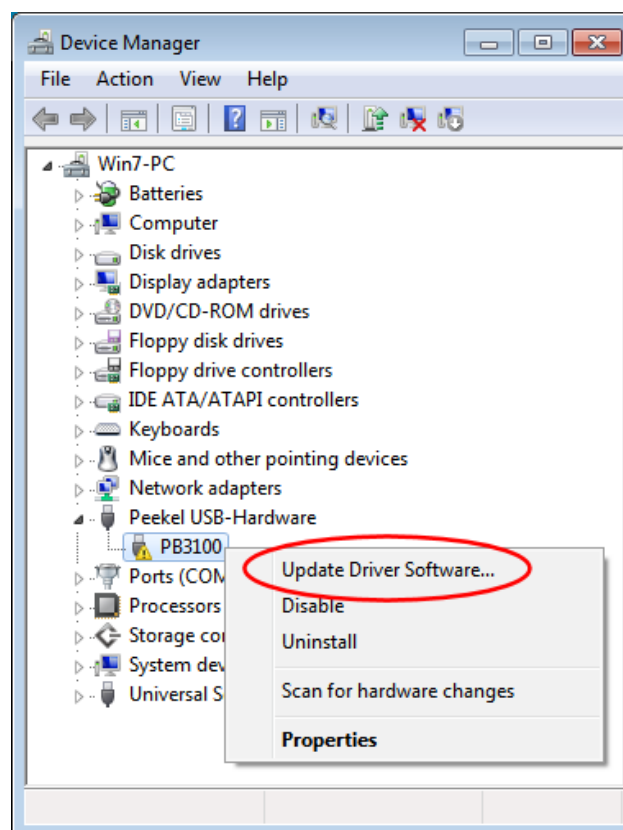
In most cases Windows 7 will not be able to find the driver without manual help. To manually install the driver, select the 'Control Panel' from the Start menu.



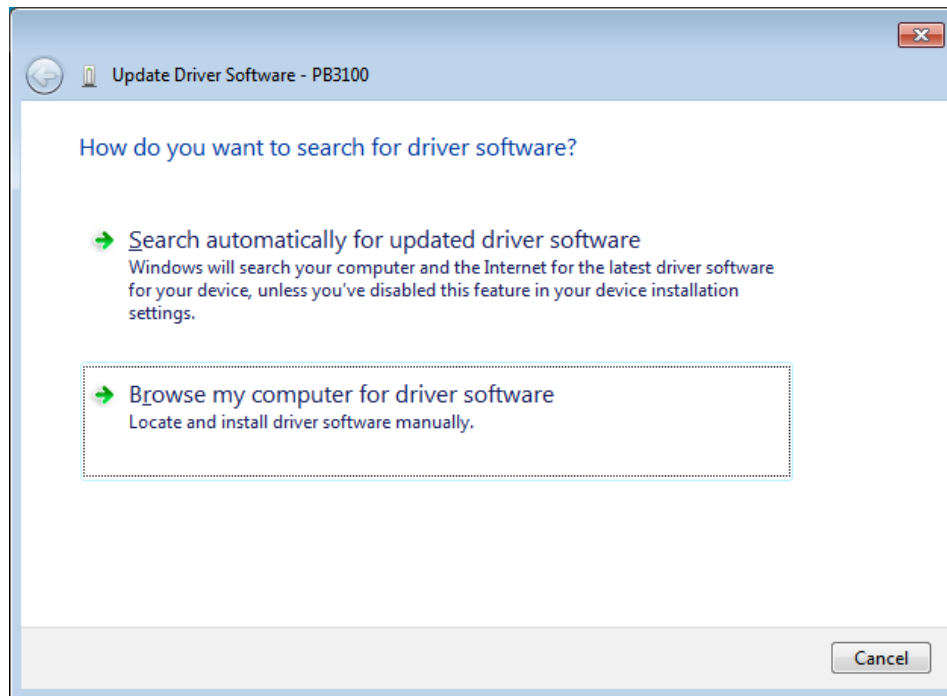
Now click on 'Hardware and Sound'.



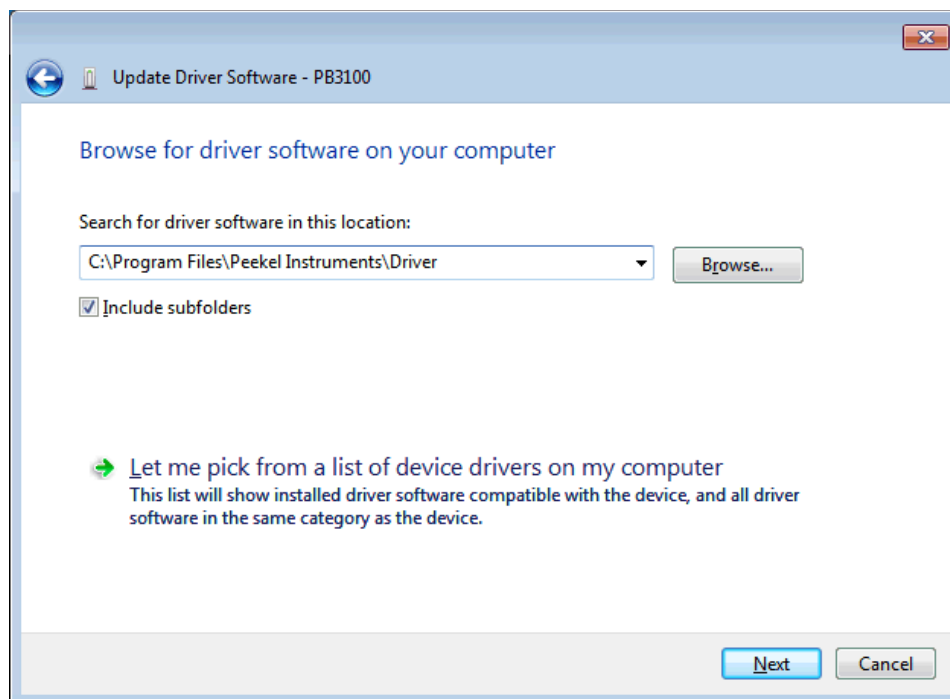
Then click on 'Device Manager'.



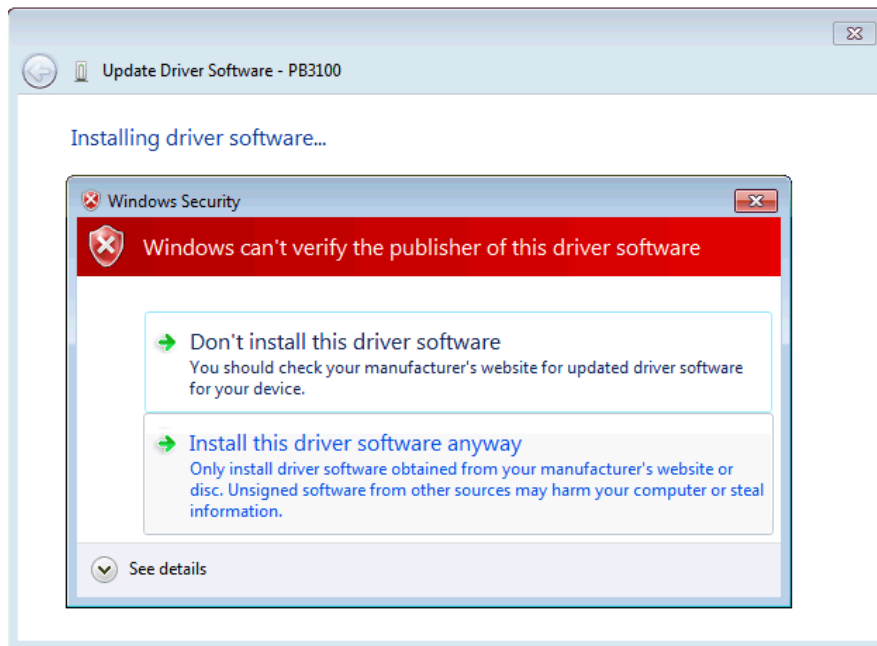
Find the entry named 'PB3100' or 'USB – Autolog 3000' (depending on the type of Autolog 3000), right click on it and select 'Update Driver Software...' from the context menu.



Now click 'Browse my computer for driver software'.



Then use the 'Browse...' button to select the installation path: either the folder 'USB-Driver' on the installation CD or 'C:\Program Files\Peekel Instruments\Driver' on the local hard disk. Now click 'Next' to continue.



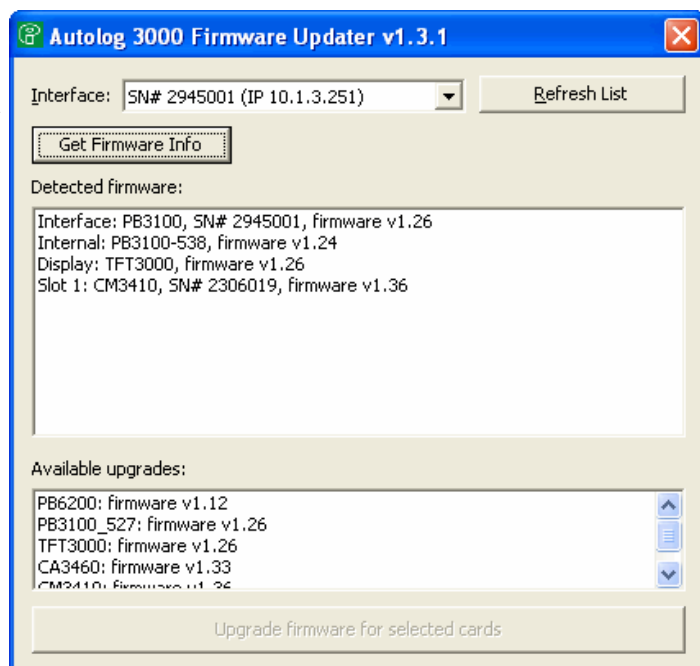
Windows 7 will show a security warning: click on 'Install this driver software anyway' to complete the installation.

1.10 Firmware Update

To update the firmware of your device to the latest state, use the Autolog_Firmware.exe package. Refer to www.peekel.com for the latest updates.

After selecting the device from the "Interface" list, click on "Get Firmware Info" to retrieve info about the current firmware in the device and measurement cards.

All items with outdated firmware versions will automatically be selected for updating. Click on the "Upgrade firmware for selected cards"-button to perform the firmware update.



Depending on the type of device, the update can take several minutes to complete. **Do not switch off the device while the firmware update is in progress.**

2 PICAS Touch

2.1 Contents of the delivery

The PICAS Touch comes with the following:

- 230VAC Power cable
- USB Cable
- Ethernet Crossover Cable for a direct connection between PC and PICAS Touch
- SD Memory Card
- CD with software and documentation

Please check your delivery for completeness.

2.2 Layout and textual conventions

The following PICAS Touch chapters contain a short introduction with general information followed by an overview of the touch display operation with concrete tips to quickly get you started with specific sensors and transducers. Further down in the manual you will find more detailed information about menus, technical information about the measurement cards and connection diagrams for the different sensor types.

This manual does not describe the use of the software Autosoft 3000. More information about this software can be found in the file “Autosoft 3000 Manual.pdf”.

To make the manual easier to read, we use the following notations:

<BUTTON>	indicates a button on the touch screen
<BUTTON>/<BUTTON>	indicates a sequence of button presses on the touch screen
Menu	indicates a menu on the display
<i>Menu item</i>	indicates a menu item on the display
TIP	contains usage tips or other useful information

2.3 Setting up

To set up the PICAS Touch, simply connect the power cable to the rear of the device and a 230VAC socket. Then switch on the device. At start-up, the device shows the menu **General** on the system level.

2.4 Device front view



18cm touch screen (capacitive), built in behind a scratch-proof glass pane.

Advice concerning the capacitive touch screen:

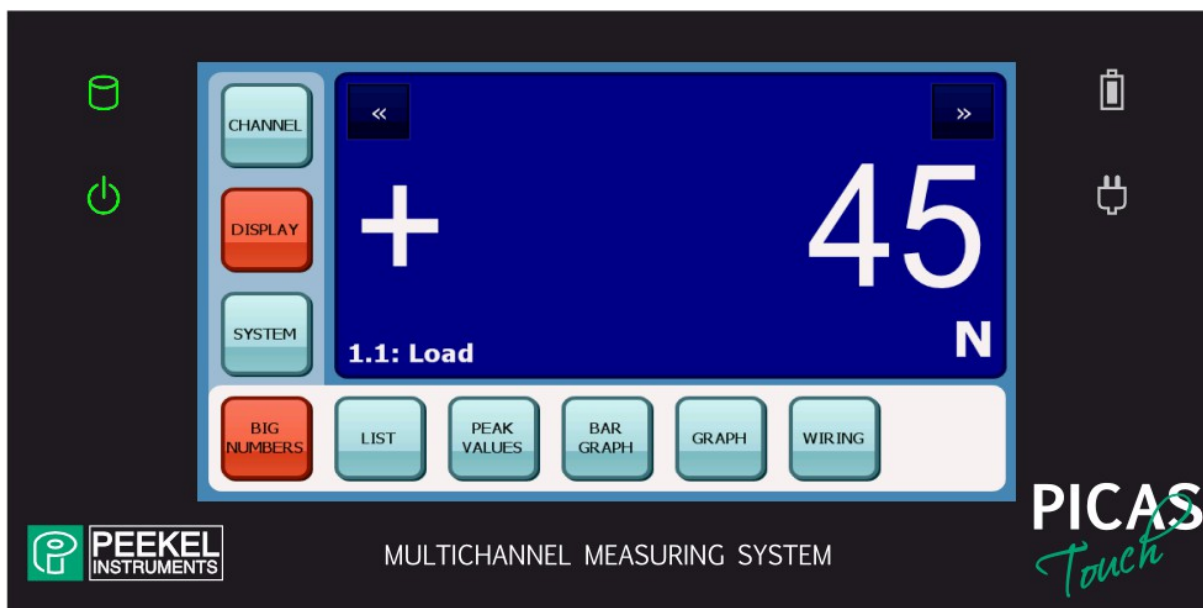
Touching the screen with a conducting object, such as a finger, causes a change in capacity. The controller detects this and uses it to calculate the coordinates where the display was touched. An advantage of this principle is a long life, since the sensing mechanism is protected from wear. The glass plane covering the display makes it easy to clean the surface.

TIP

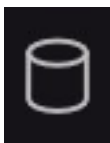
For optimal use of the touch screen the contact area of the finger is decisive and not the amount of pressure. Therefore it is advisable to use your thumb to operate the display instead of your index finger. Just try it out!

Touch pens can only be used when they are conductive and specifically designed to operate capacitive screens.

2.4.1 Details of the front side



Device LED: ON / OFF



Logging LED

LED off: No logging is active

LED on: Logging is active

LED blinks: Logging is active and data currently gets written to memory.

Beware: While this LED is on or blinks, do not remove the SD card from the device. Stop logging before removing the card and check that the red warning light next to the SD card slot is off.



230VAC-LED

LED on: Device is powered by 230VAC.



Battery LED

When this LED is on, the device is powered by battery.

Note: The battery card CP-Li-Ion has its own LED's showing the charge condition, so the Battery LED on the front of the PICAS Touch is currently not used.

2.4.2 Detailed contents of the display

Control levels

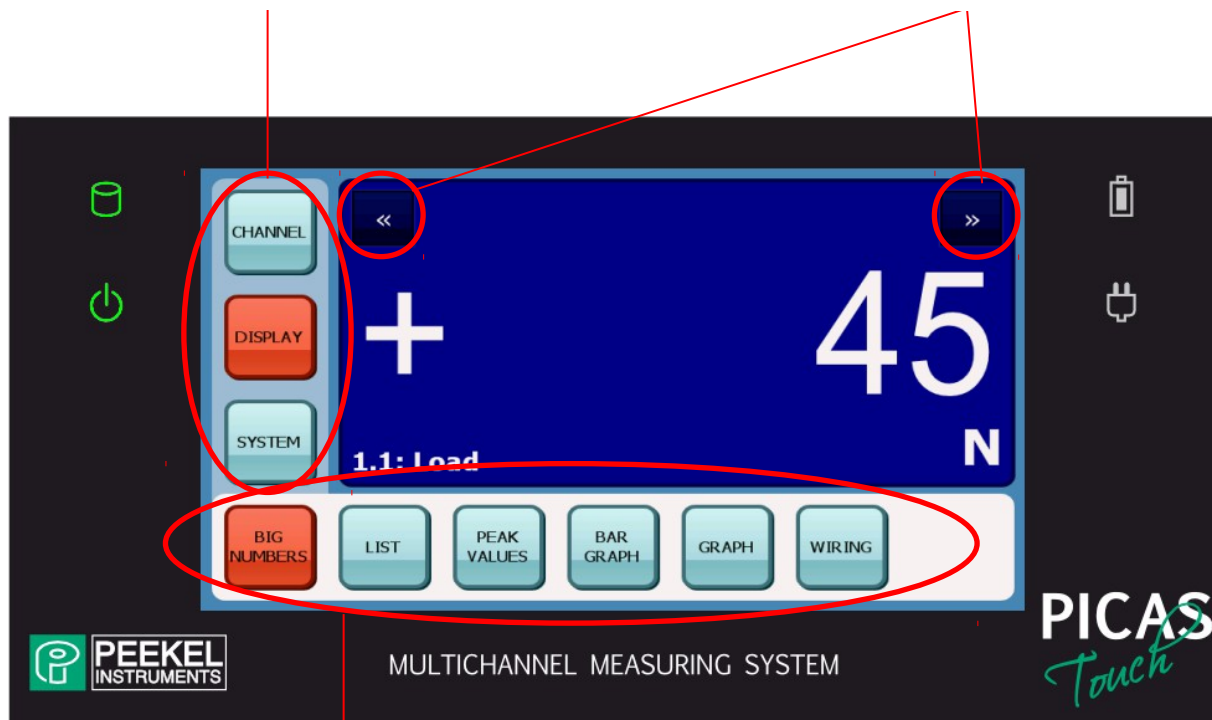
CHANNEL – Channel settings

DISPLAY – Selection of different online display modes

SYSTEM – System settings and logging

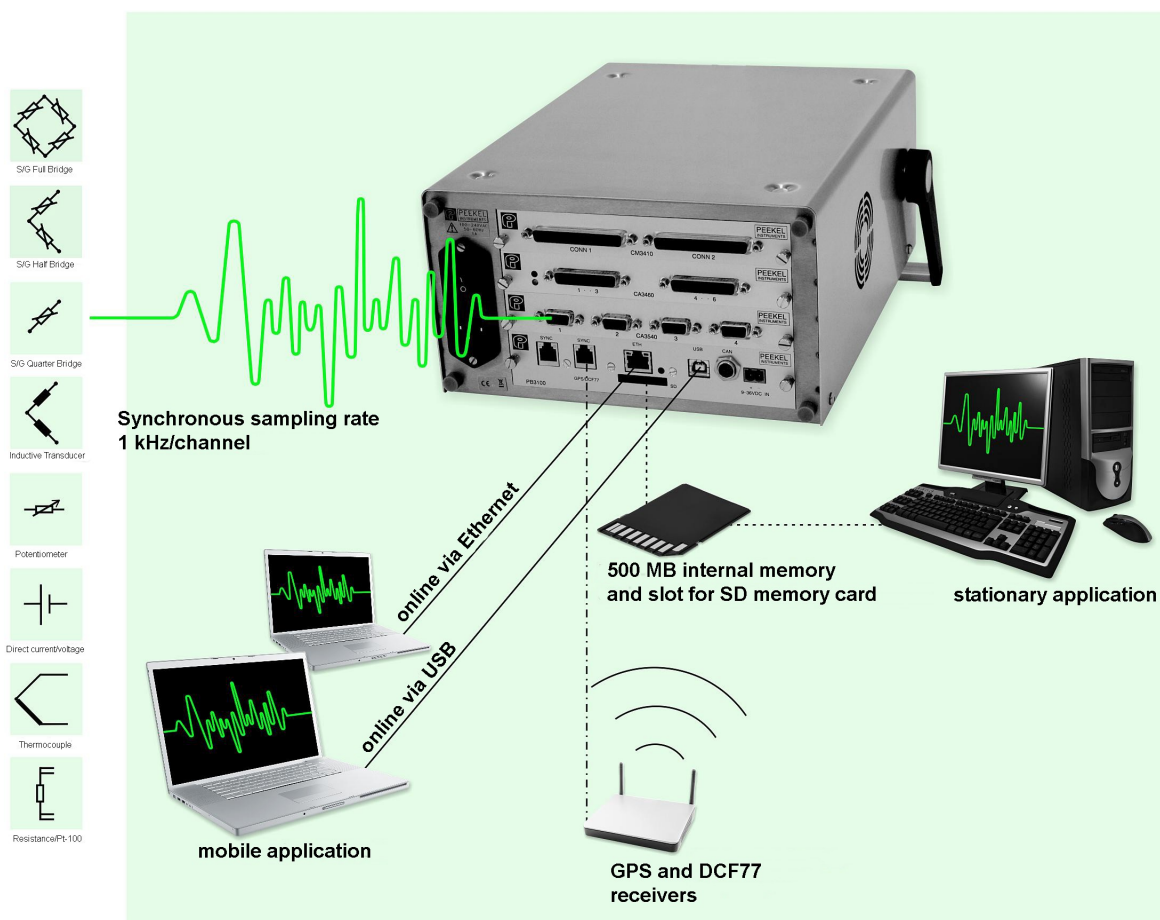
Scroll buttons

to switch to the previous or next channel



Buttons, dependent on the selected control level.

Within the CHANNEL-level the button selection varies depending on the selected sensor type.



The housing offers room for 1-3 measurement cards. The lowest slot (#4) is reserved for the PB3100 controller card. Above that are slots #1 (topmost) to #3. On the left side is the 230VAC Net entry.

2.6 Connecting PICAS Touch with a PC

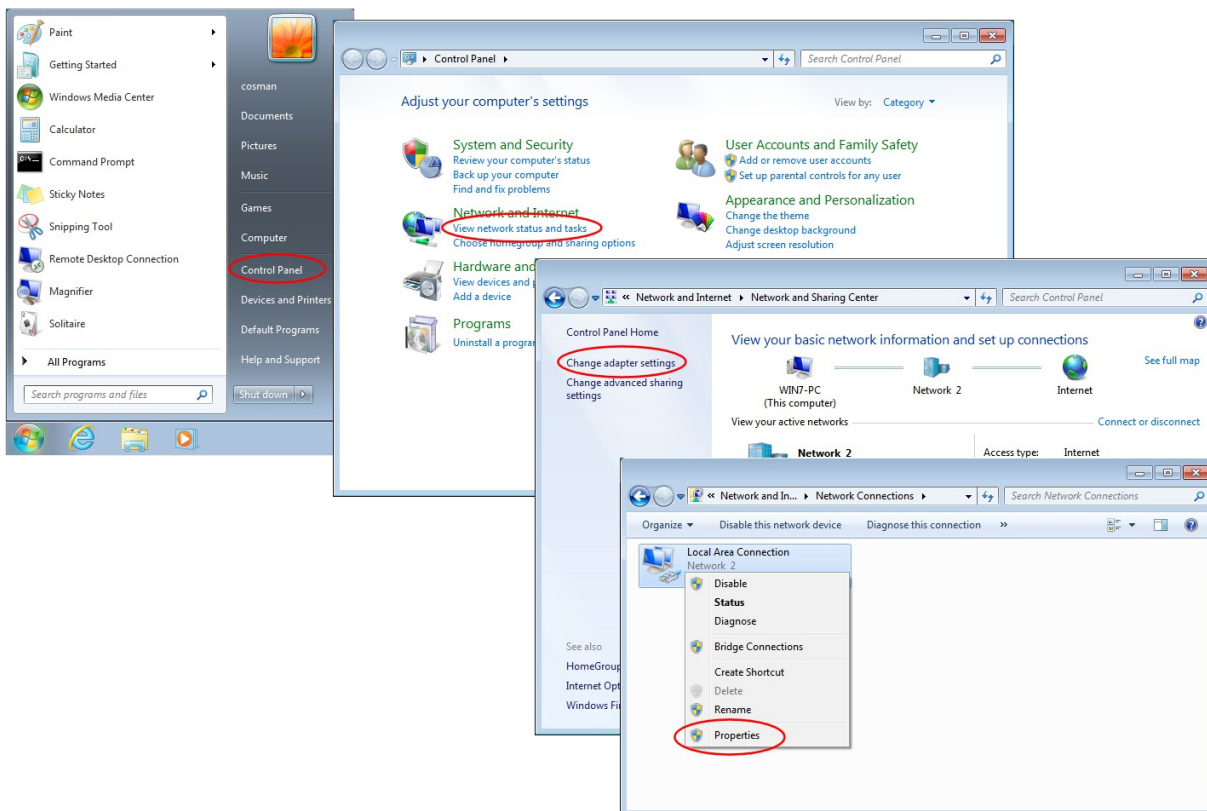
A PICAS Touch or AUTOLOG 3000 with PB3100 communication card can be connected to a PC through USB or Ethernet.

2.6.1 Ethernet connection

For connecting the device via Ethernet the usual rules apply: when the PC connected to the PICAS Touch through a single Ethernet cable, it must be a cross-cable (included in the delivery). When the connection goes through a switch or router, a standard Ethernet cable should be used (not included), although modern switches will often auto-detect the cable type and correct for it.

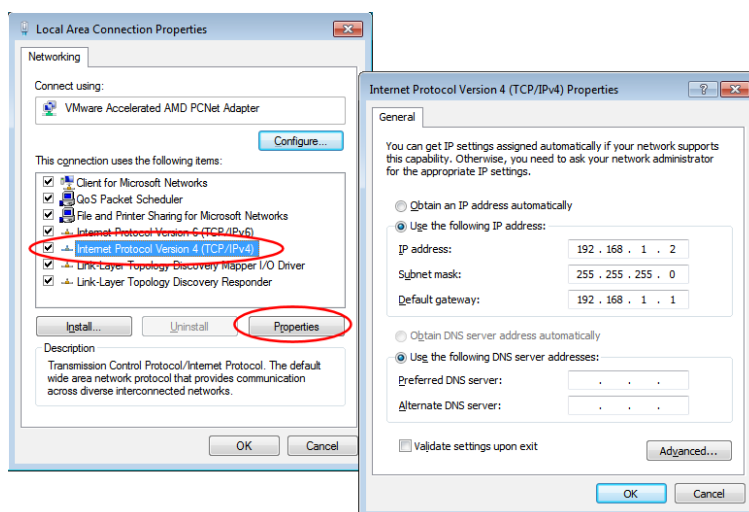
The next step is to check the IP address of your PC. For this, open the network settings on your PC:

Start -> Control Panel -> View network status and tasks -> Change adapter settings



Then right-click on the Ethernet connection and choose 'Properties' from the context menu.

Select 'Internet Protocol Version 4 (TCP/IPv4)', then click 'Properties'.



Here you can check and set the current IP address. If the PC is configured to 'Obtain an IP address automatically', then the current IP address is not shown. In this case, you can use the same (default) setting on the PICAS Touch.

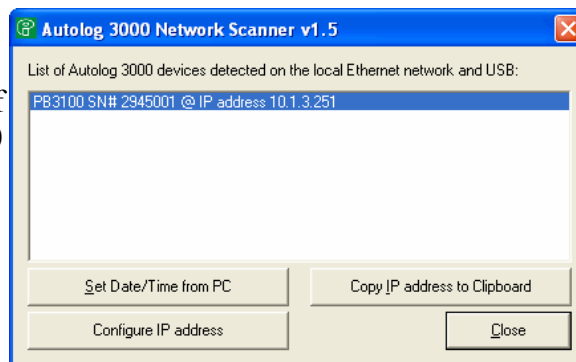
Note: if you use this 'automatic' mode with just a single PC and PICAS Touch (not connected to a central network), then the PC will probably show a 'limited connection' warning, and it can take up to 2 minutes for the PC to find the PICAS Touch.

Note: The screen shots above apply to Windows 7, other operating systems may look different.

2.6.1.1 The Tool Autolog 3000 Scanner

On the CD you can find a directory 'Tools' that contains the program Autolog3000Scanner, which can be used to detect and configure the IP address of the PICAS Touch or AUTOLOG 3000 with PB3100 card. This tool is also installed together with the Autolog 3000 Configurator software.

When a PICAS Touch is connected to the PC through an Ethernet connection, it should appear as a listed item in this tool. If it does not, then the IP addresses of PC and PICAS Touch do not match.

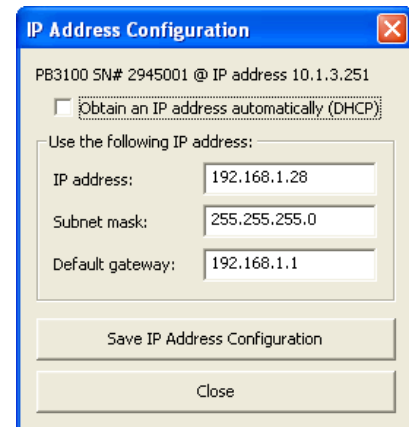


For a PC to be able to communicate, its IP address should be in the same range as the IP address of the PICAS Touch / AUTOLOG 3000. For example, if the PC has IP address 192.168.1.2 and subnet mask 255.255.255.0, the data acquisition device should also have an IP address that starts with 192.168.1.x, and subnet mask 255.255.255.0. When the PB3100 has firmware v1.24 or higher, its IP address should always be shown in the list, even if it is in a different range. In that case, the address must be changed using the "Configure IP address" button, before other

communication with the device is possible. If the device is not visible using the scanner tool, it may be necessary to change its IP address using the IP Configurator-tool (see chapter 2.6.1.2).

Configure IP address: after clicking on the “Configure IP address” button, the current IP configuration is retrieved from the selected device. The default settings are shown in the screen shot. After changing the settings, click the “Save IP Address Configuration”-button to send them to the device. They are stored in non-volatile memory, but will only become active after powering the device OFF/ON.

Set Date/Time from PC: use this button to verify the real time clock on the PB3100 communication card, and synchronise it with the PC time.

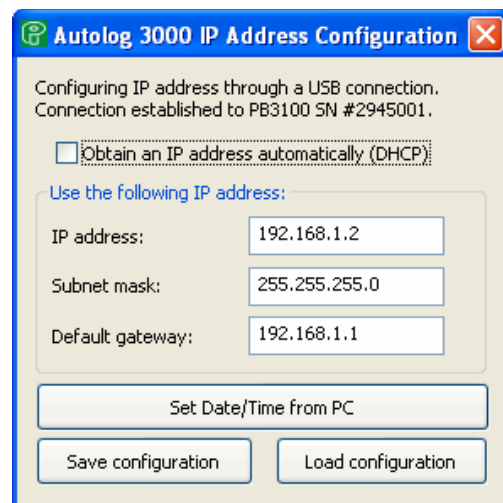


2.6.1.2 The Tool IP Configurator

On the CD you can find a directory ‘Tools’ that contains the program IPConfigurator, which can be used to configure the IP address of the PICAS Touch through a USB connection.

To do this, you must first connect the PICAS Touch to the PC with a **USB** cable. When all is well, the dialog will show this connection, including the serial number of the device. If IPConfigurator does not show this serial number, then please check the installation of the USB driver (see below).

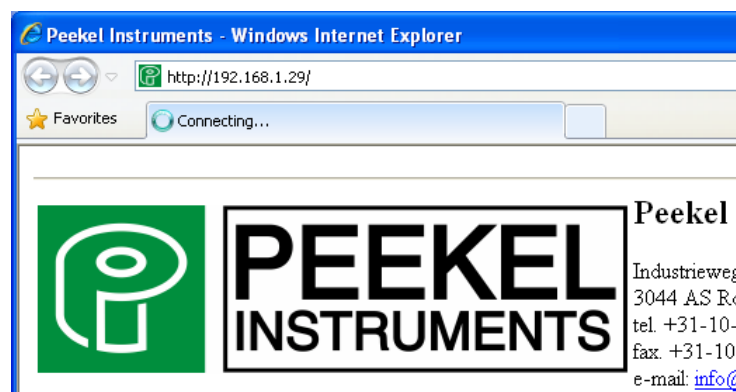
For manual configuration, enter the correct IP address and subnet mask, then click ‘Save configuration’. You will get a message to switch the device off/on. After that, the configured IP address will be used.



2.6.2 PICAS Touch with Internet Explorer

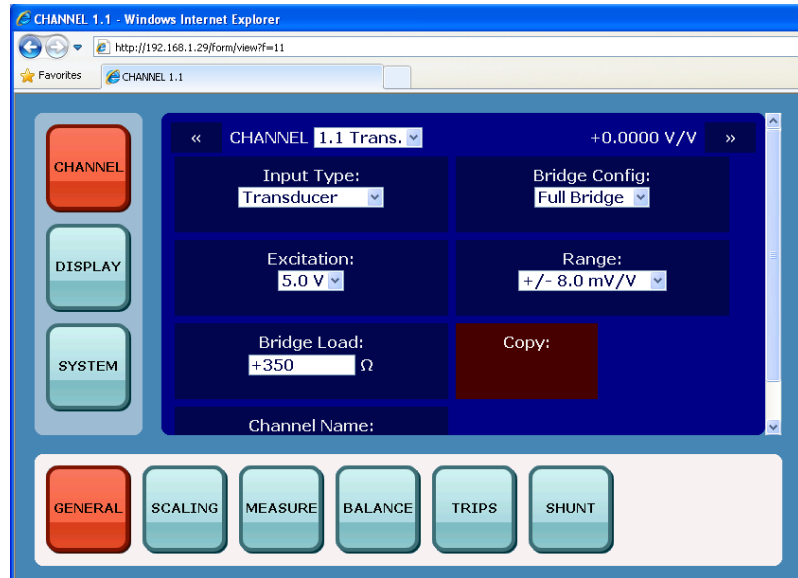
PICAS Touch (and AUTOLOG 3000 with PB31000 communication card) has a built-in web interface which can be used to configure the device from any web browser.

To do this, enter the IP address of the PICAS Touch as the web address in Internet Explorer, e.g. ‘192.168.1.29’ <ENTER>.



The Internet Explorer window now shows an image similar to the touch screen display. The menus are not graphical, but shown as pull down menus.

Measurement values can only be shown in numerical form, either a single (big) value, a list of values or peak values.



Note: If you can not access this page, please check the following:

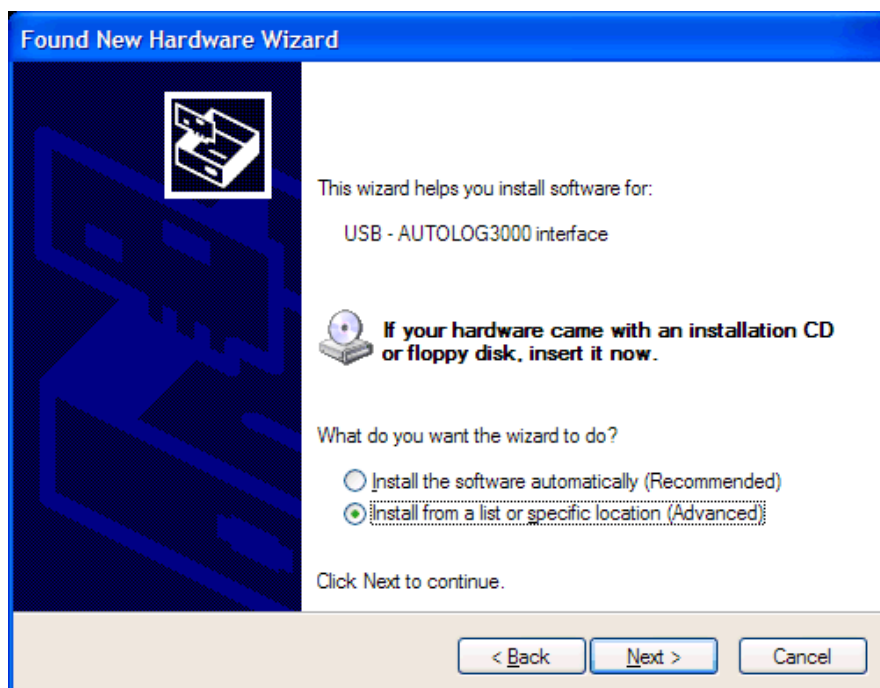
1. Is the device configured to accept web connections? This can be seen on the display under 'PASSWORD' on the 'SYSTEM' level.
2. Do the IP addresses of the PC and PICAS Touch match? Check with the Autolog 3000 Scanner Tool (see above).
3. Check if a proxy server is configured in Internet Explorer, this should be switched off. Tools → Internet Options → Connections → LAN settings → switch off proxy server.

2.6.3 USB Driver Installation (Windows XP)

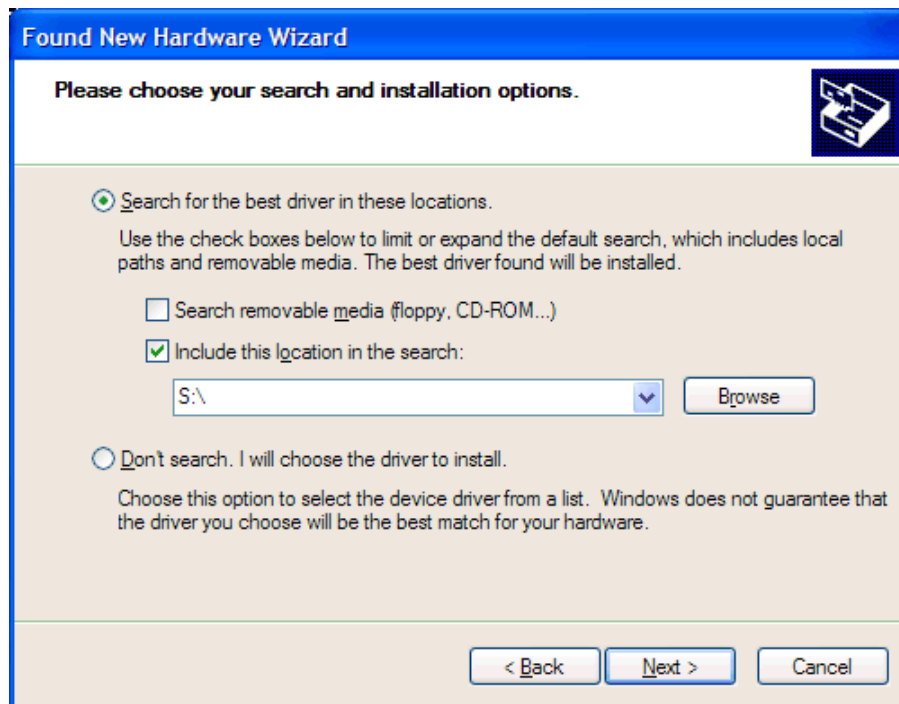
Start the PC, connect the PICAS Touch to the PC using a USB cable and switch on the device. Windows will automatically detect a new device named 'PB3100' and show the following dialog:



Select the 'No, not this time' option and click 'Next' to continue.



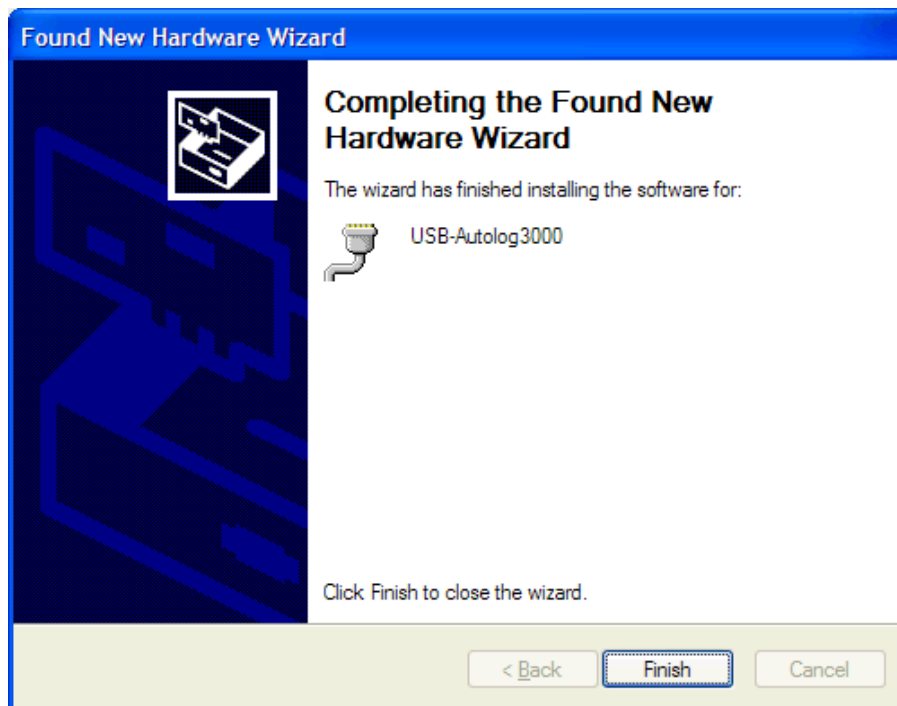
Now select 'Install from a list of specific location (Advanced)' and click 'Next'.



Choose 'Search for the best driver...' and check the 'Include this location in the search' box. Then browse for the location of the driver, which can be found in the root directory of the installation CD. Click 'Next' to continue.



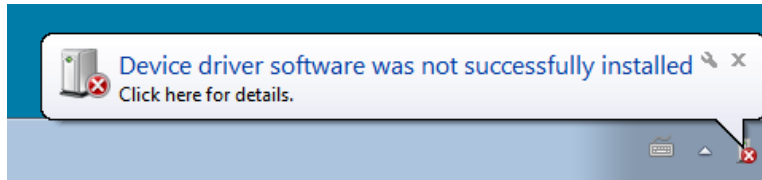
Windows XP will warn about 'Windows Logo testing', click 'Continue Anyway' to complete the installation. (Note: the screen shots show 'USB-Autolog3000', for PICAS Touch this will be 'PB3100' or 'Picas Touch').



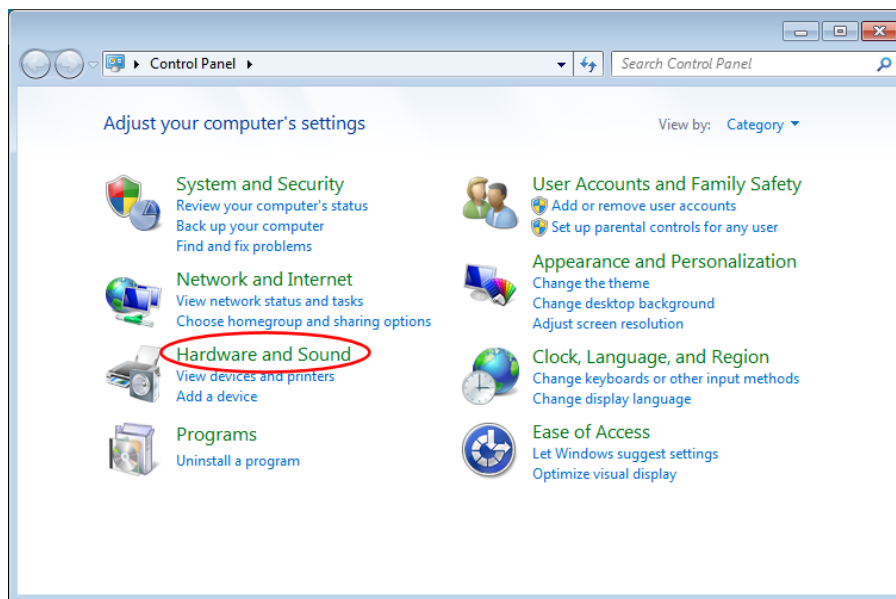
The PICAS Touch device driver is now installed.

2.6.4 USB Driver Installation (Windows 7)

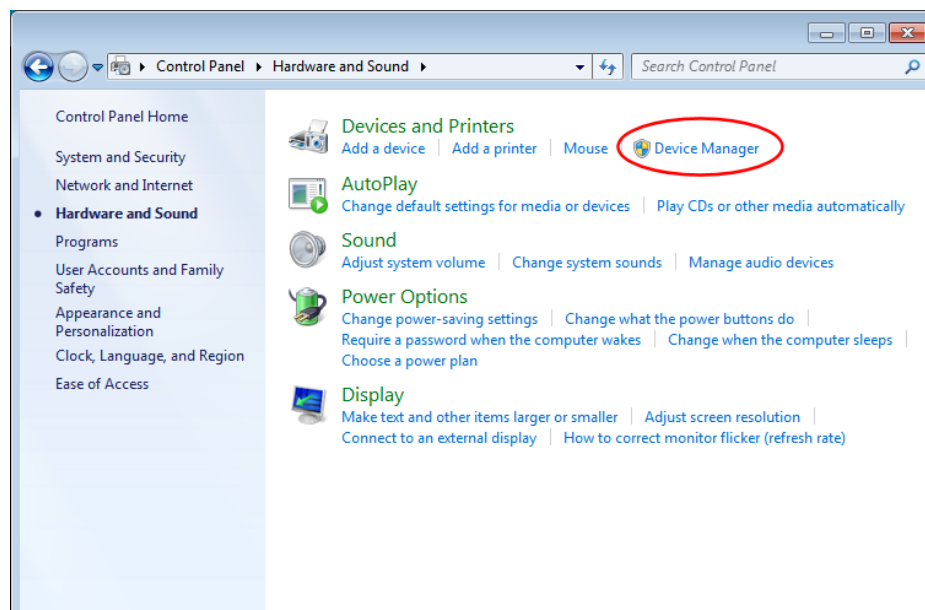
Start the PC, connect the PICAS Touch to the PC using a USB cable and switch on the device. Windows will automatically detect a new device and try to install a driver for it.



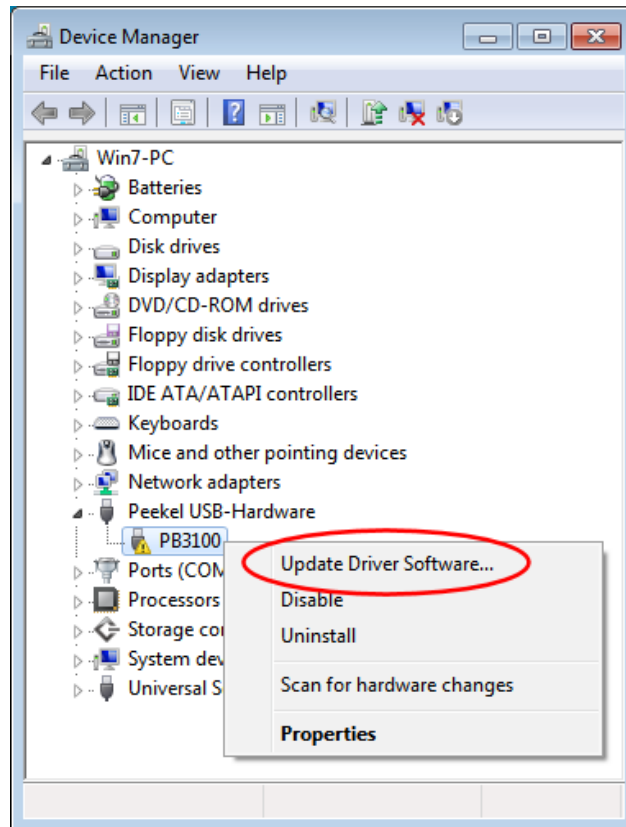
In most cases Windows 7 will not be able to find the driver without manual help. To manually install the driver, select the 'Control Panel' from the Start menu.



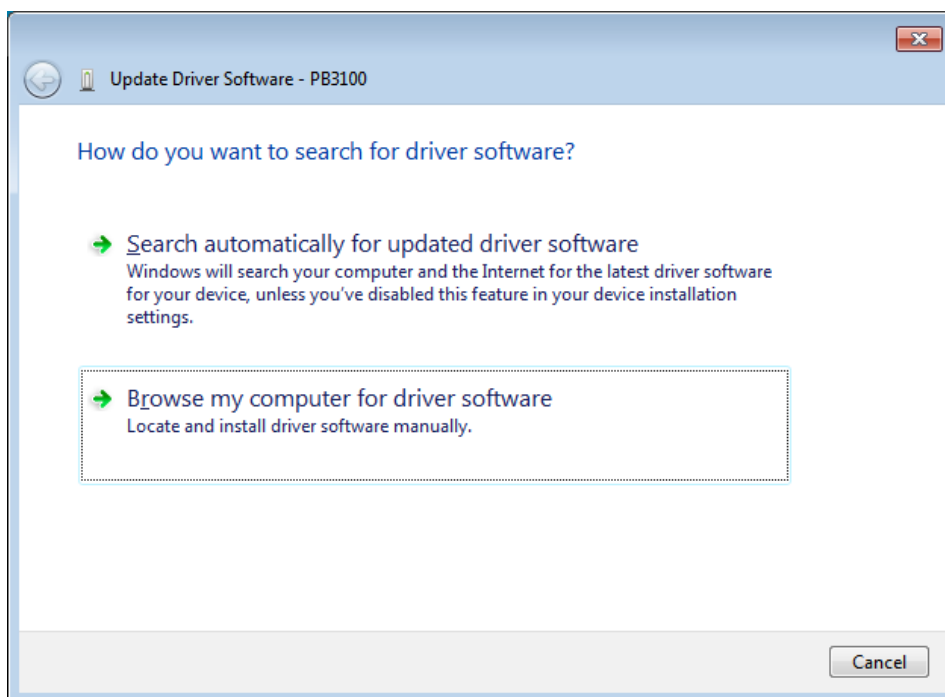
Now click on 'Hardware and Sound'.



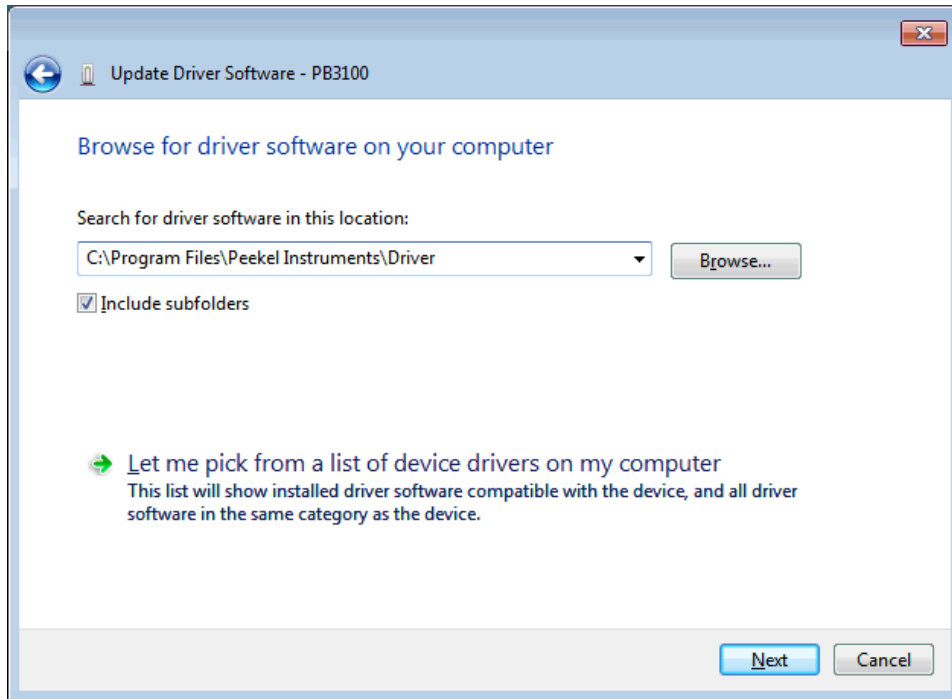
Then click on 'Device Manager'.



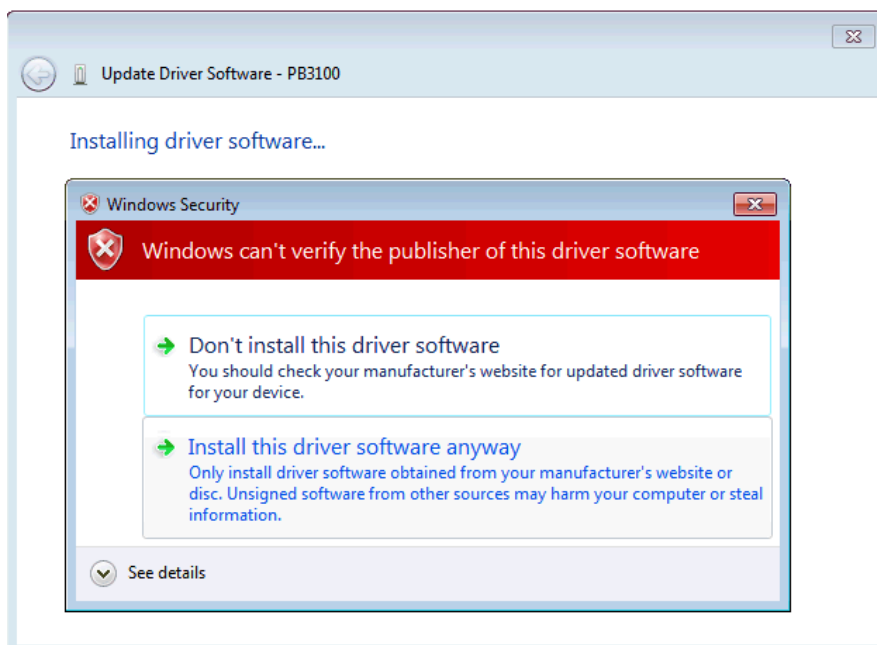
Find the entry named 'PB3100', right click on it and select 'Update Driver Software...' from the context menu.



Now click 'Browse my computer for driver software'.



Then use the 'Browse...' button to select the installation path: either the folder 'USB-Driver' on the installation CD or 'C:\Program Files\Peekel Instruments\Driver' on the local hard disk. Now click 'Next' to continue.



Windows 7 will show a security warning: click on 'Install this driver software anyway' to complete the installation.

3 PICAS Touch: The short road to success by example

Before going into a detailed description of the individual menus in later chapter, this chapter will show you how to get started with PICAS Touch, by means of quick examples.

Before we get started, please do the following:

- Have a sensor ready to connect to the device
- Connect the power and switch the device on

We start with the display layout: fundamentally, the contents are divided into three levels: <CHANNEL>, <DISPLAY> and <SYSTEM>, the buttons on the top left of the screen.

The horizontal row of buttons at the bottom of the display are dependent on the selected level. The colors of the buttons show which menu is currently selected/active.

Level 1: <CHANNEL>

Here you can set the parameters for each individual channel. By pressing the <CHANNEL> button **twice** you will get a list of all available channels in the PICAS Touch to choose from. The channel number contains the slot number of the measurement card followed by the channel number on the card.

Level 2: <DISPLAY>

Several different display modes for the measurement values.

Level 3: <SYSTEM>

On this level you can find the basic settings of the PICAS Touch, storage of measurement configurations and settings for data logging.

3.1 Measurement with a transducer

The specifications of the transducer in this example are:

10kN nominal load / sensitivity: 2mV/V / resistance: 350 Ohms

Procedure:

Use the button <CHANNEL> to select the channel to configure.

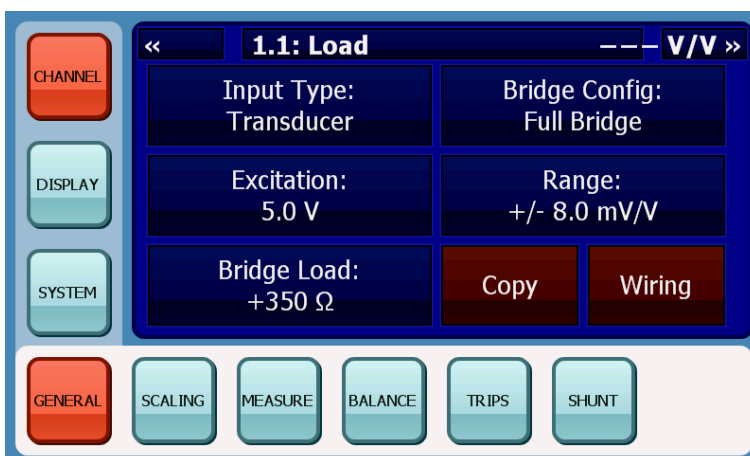
Menu: **Input Type**

Select *Transducer*

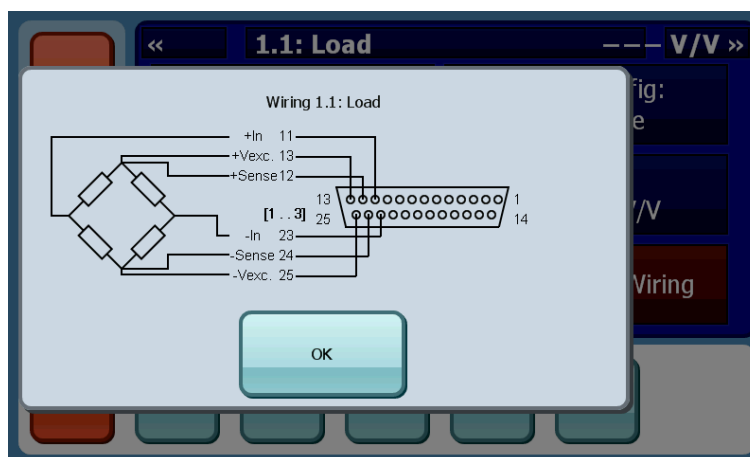


Select *Full Bridge*

Enter *350 Ohms*



Button <WIRING>
shows how to connect the
sensor

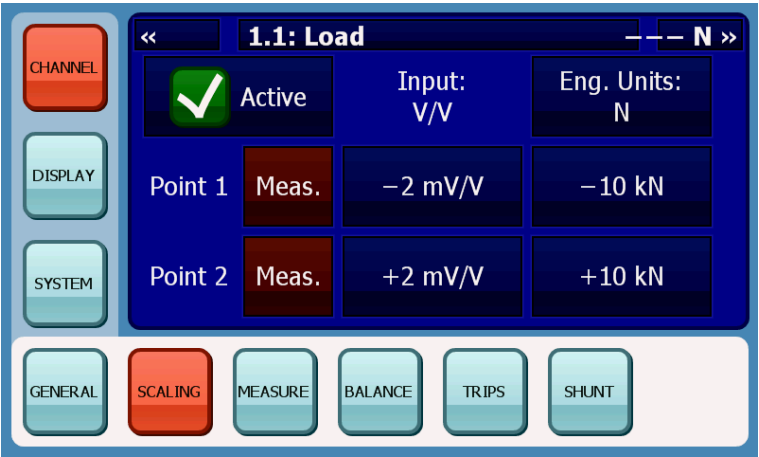


Button <SCALING>

Activate scaling

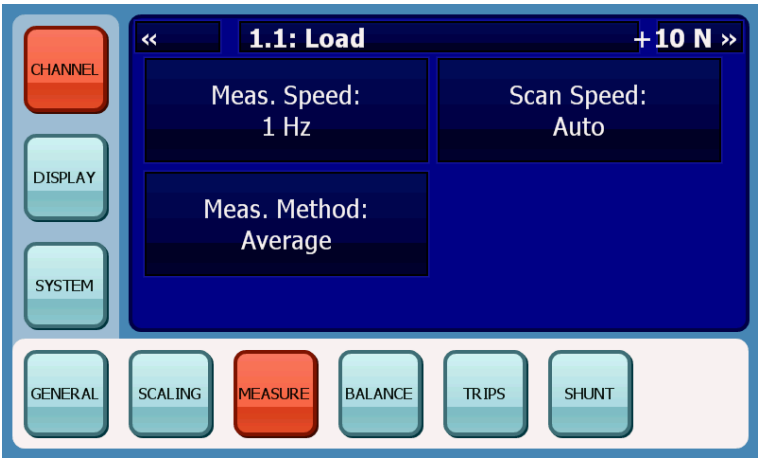
Eng. Units: select N

Enter Point 1 and Point 2



Button <MEASURE>

Meas. Speed: 1Hz



Button <BALANCE>

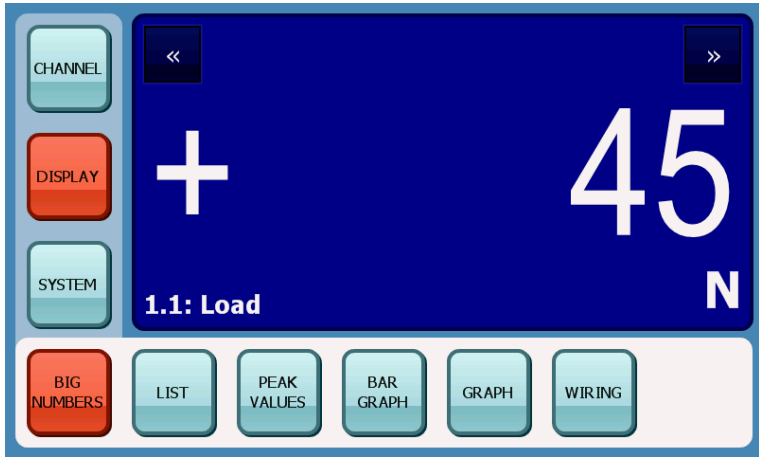
Activate Tare

Press button <Auto Tare>



Checking the result

Button <DISPLAY>



3.2 Measurement with a ¼ Bridge Strain Gauge

The specifications of the strain gauge in this example:
gage factor = 2.05/ resistance: 350 Ohms

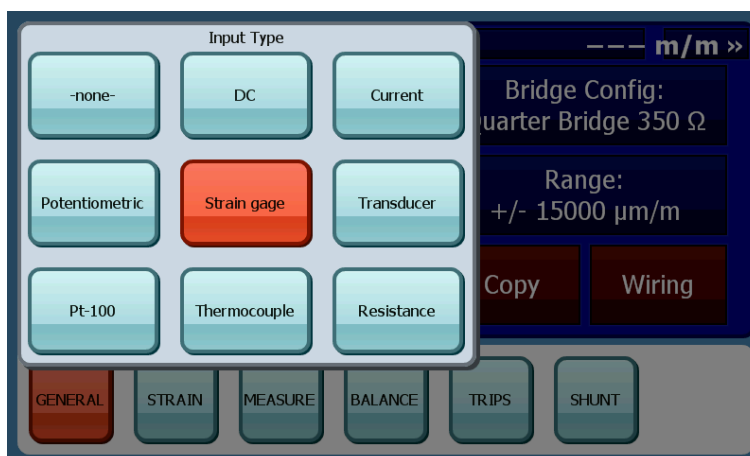
Note: S/G ¼- and ½ Bridge can only be connected to CA3460 measurement cards with Option 1, and to CM3410 multiplexer cards.

Procedure:

Use the button <CHANNEL> to select the channel to configure.

Menu: **Input Type**

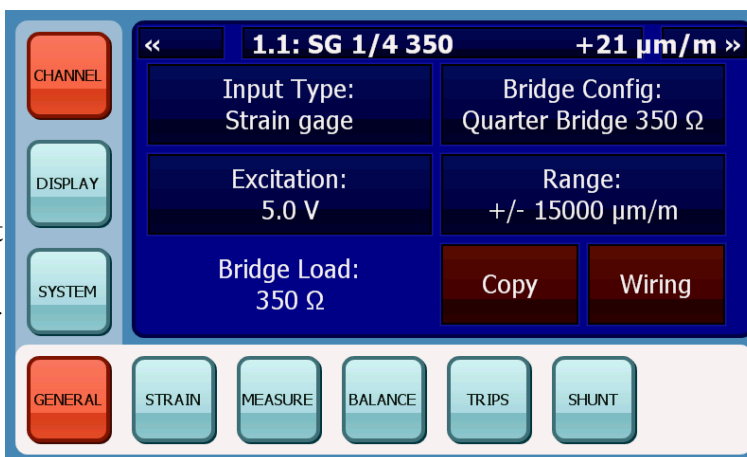
Select *Strain gage*



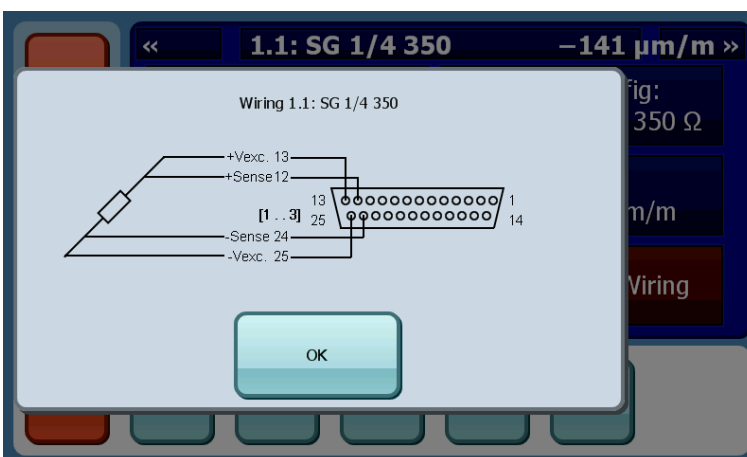
Bridge Config:

Select *Quarter Bridge 350 Ohms*

For the selection of the excitation voltage it is important to look at the size of the S/G and the material it is attached to. A high excitation voltage is desirable, but it can also lead to temperature drift.



Button <WIRING> shows how to connect the sensor



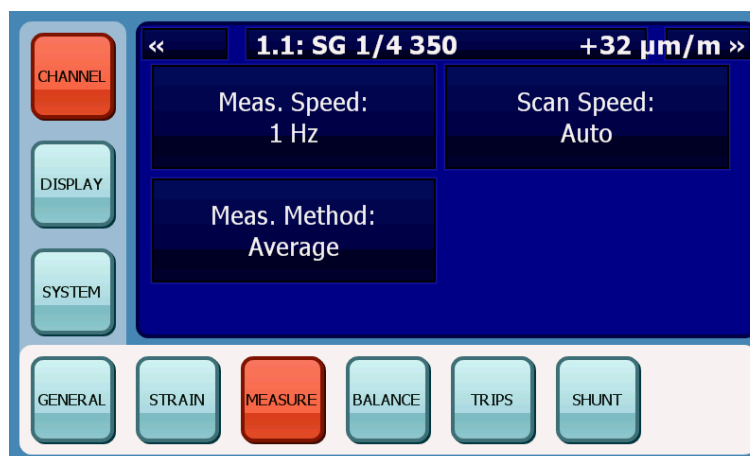
Button <STRAIN>

Enter the **Gage Factor** of the strain gauge



Button <MEASURE>

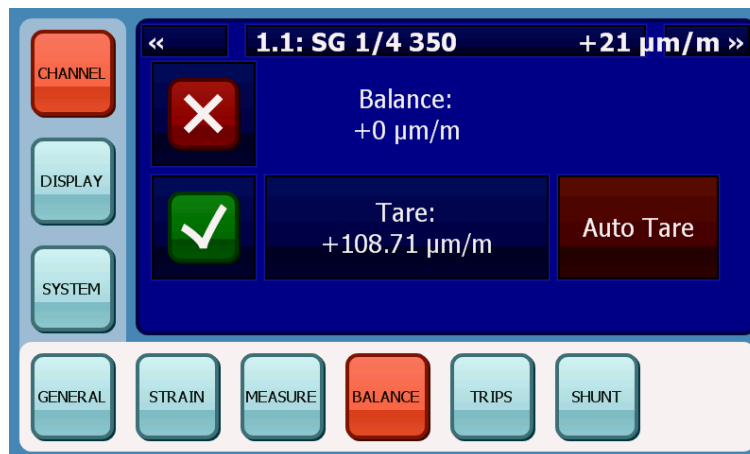
Meas. Speed: 1Hz



Button <BALANCE>

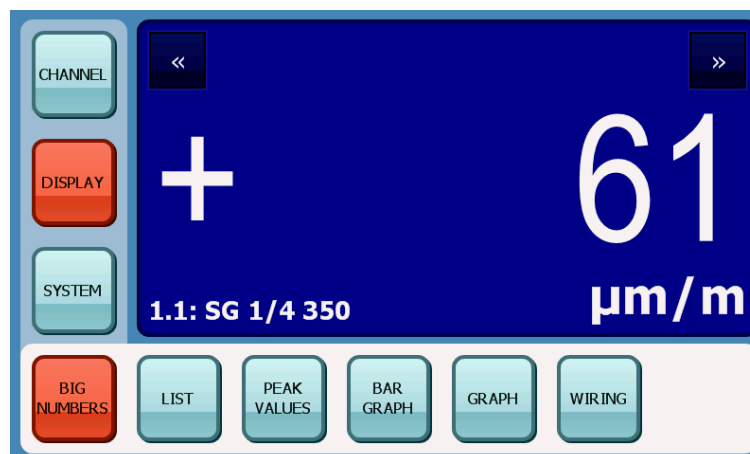
Activate Tare

Press button <Auto Tare>



Checking the result

Button <DISPLAY>



3.3 Measurement with a ¼ Bridge Strain Gauge

The specifications of the strain gauge in this example:

gage factor = 2.1/ resistance: 350 Ohms

One of the two strain gauges is attached at an angle of 90°, perpendicular to the major direction, and is primarily used for compensation.

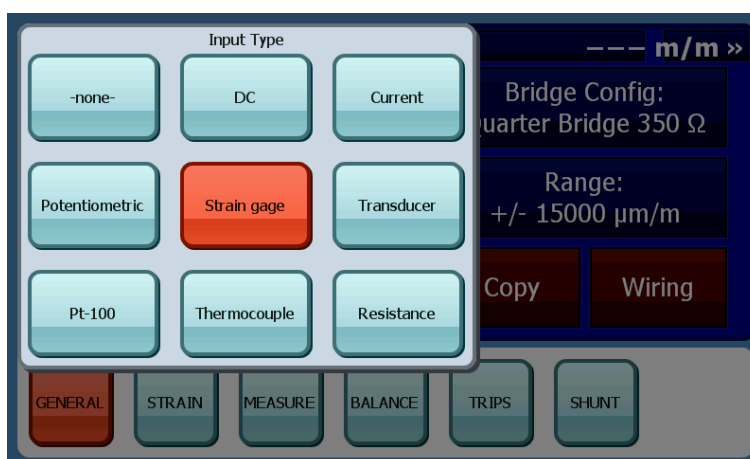
Note: S/G ¼- and ½ Bridge can only be connected to CA3460 measurement cards with Option 1, and to CM3410 multiplexer cards.

Procedure:

Use the button <CHANNEL> to select the channel to configure.

Menu: **Input Type**

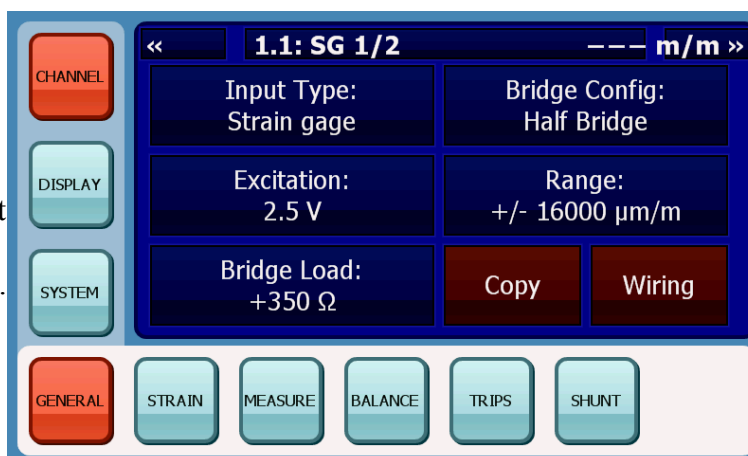
Select *Strain gage*



Bridge Config:

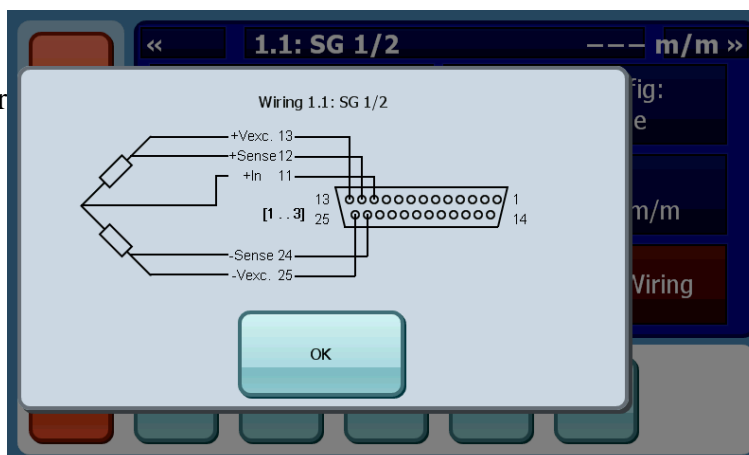
Select *Half Bridge*

For the selection of the excitation voltage it is important to look at the size of the S/G and the material it is attached to. A high excitation voltage is desirable, but it can also lead to temperature drift.



Button <WIRING>

shows how to connect the sensor



Button <STRAIN>

Enter the **Gage Factor** of the strain gauge

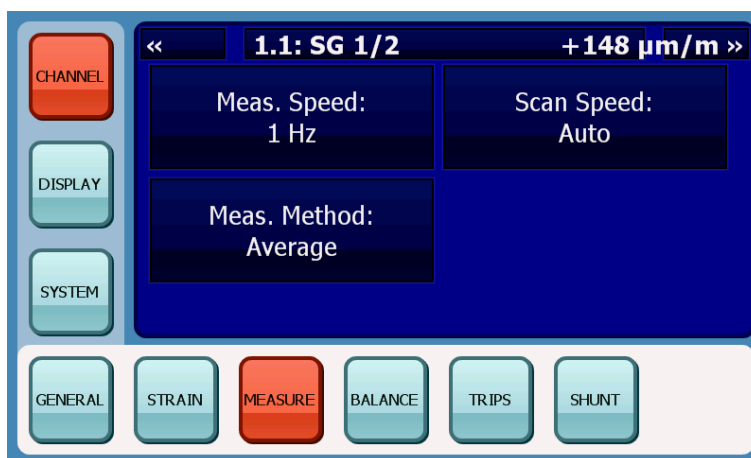
Bridge Factor: 1.3

Because the 2nd S/G is at a 90° angle, its strain does not count toward the result for the full 100%. The transverse sensitivity for steel is about 0.3.



Button <MEASURE>

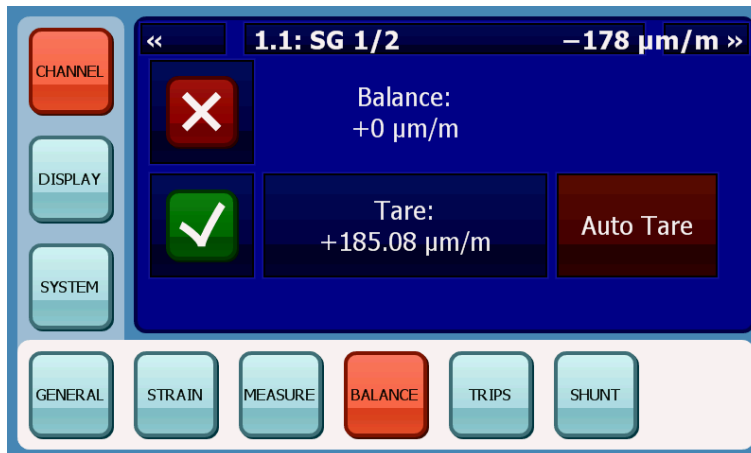
Meas. Speed: 1Hz



Button <BALANCE>

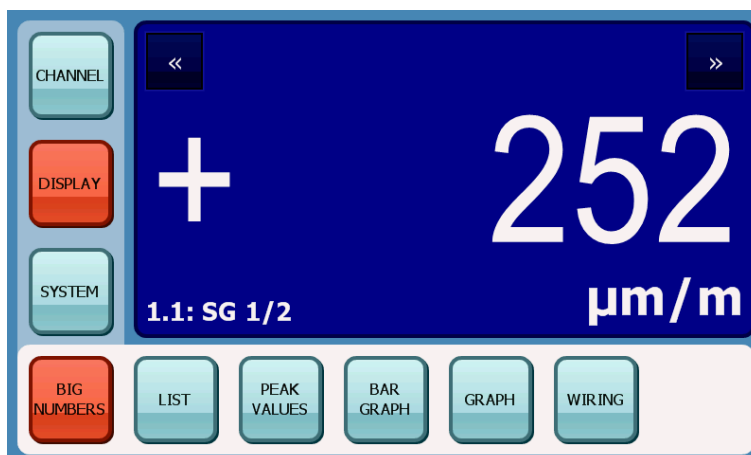
Activate Tare

Press button <Auto Tare>



Checking the result

Button <DISPLAY>



3.4 Measurement with an Inductive Displacement Transducer

3.4.1 Example a): Work with data from the manufacturer of the transducer

Note: Inductive Displacement Transducers can only be connected to CA3460 measurement cards with Option 2.

The specifications of the transducer in this example:

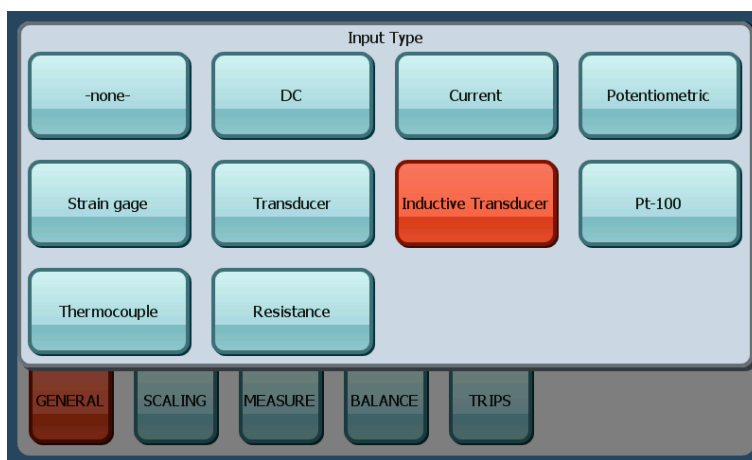
Inductive half bridge / +/-5mm nominal displacement / Sensitivity: +/-80mV/V

Procedure:

Use the button <CHANNEL> to select the channel to configure.

Menu: **Input Type**

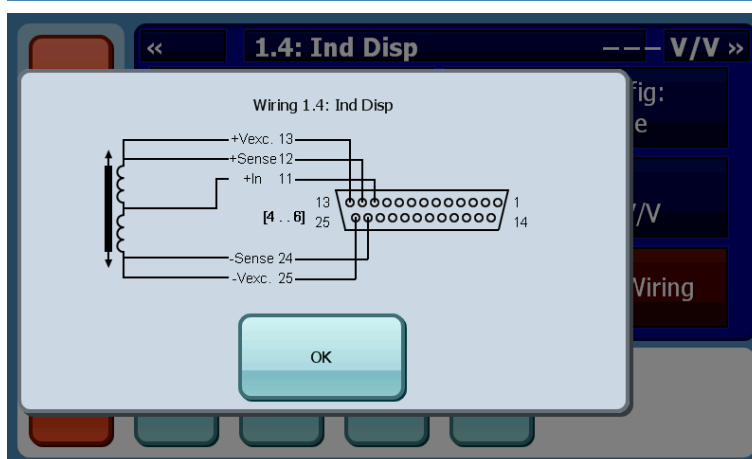
Select *Inductive Transducer*



Select *Half Bridge*



Button <WIRING>
shows how to connect the sensor

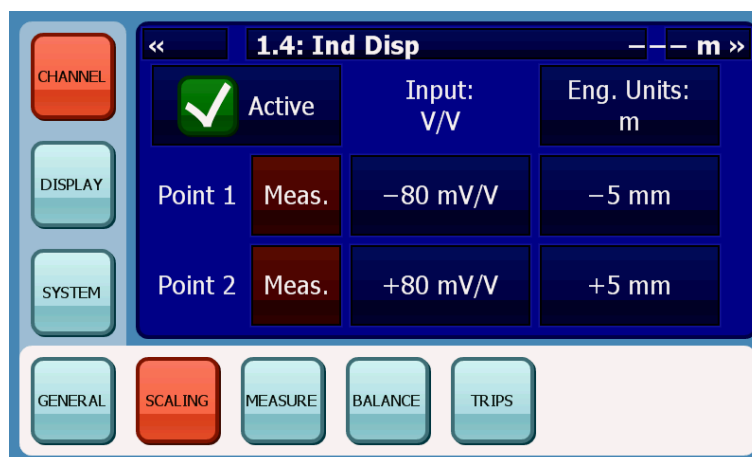


Button <SCALING>

Activate scaling

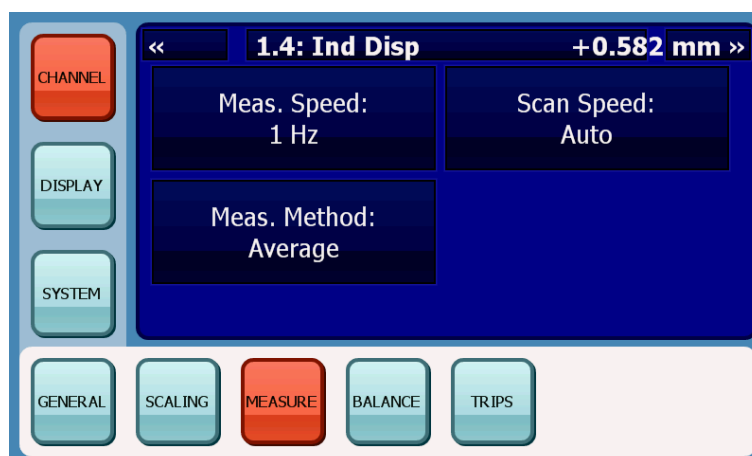
Eng. Units: select **m**

Enter Point 1 and Point 2



Button <MEASURE>

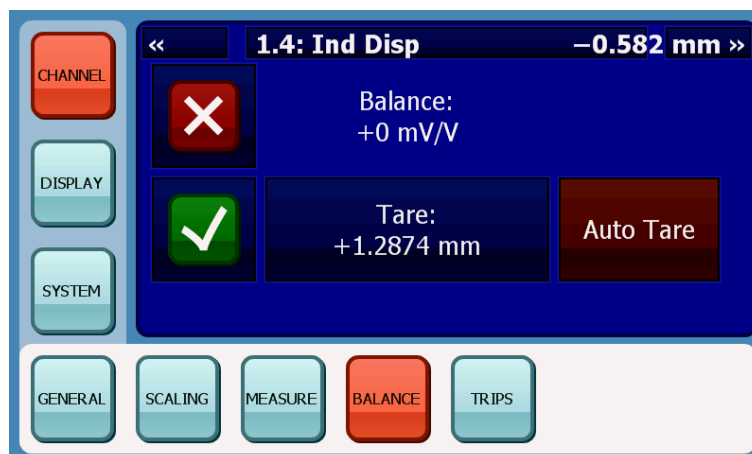
Meas. Speed: 1Hz



Button <BALANCE>

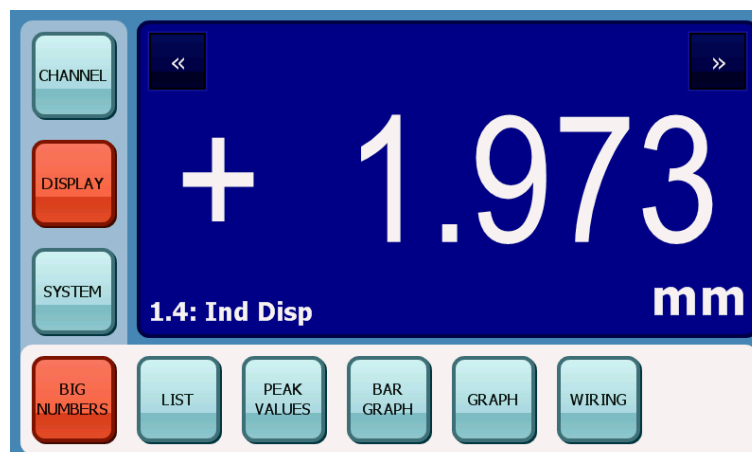
Activate Tare

Press button <Auto Tare>



Checking the result

Button <DISPLAY>



3.4.2 Example b): Transducer specifications unknown: transducer can be calibrated

Note: Inductive Displacement Transducers can only be connected to CA3460 measurement cards with Option 2.

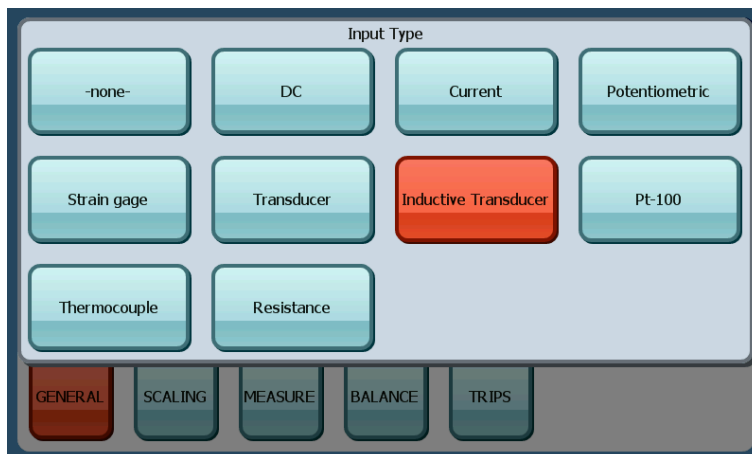
The known specifications of the transducer in this example:
Inductive half bridge / +/-2mm nominal displacement

Procedure:

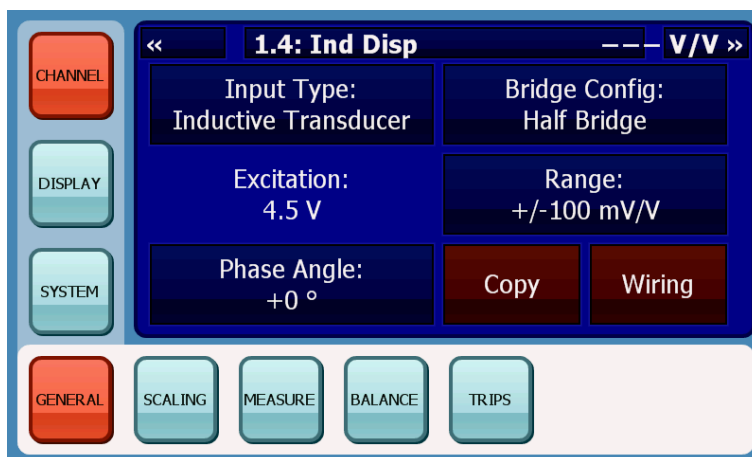
Use the button <CHANNEL> to select the channel to configure.

Menu: **Input Type**

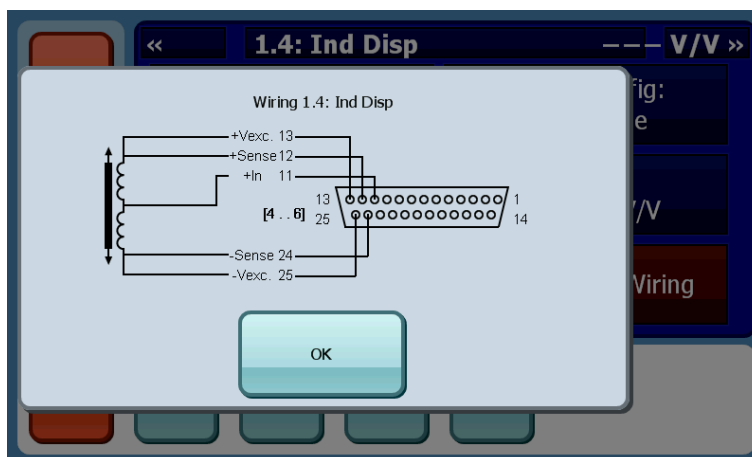
Select *Inductive Transducer*



Select *Half Bridge*



Button <WIRING>
shows how to connect the sensor



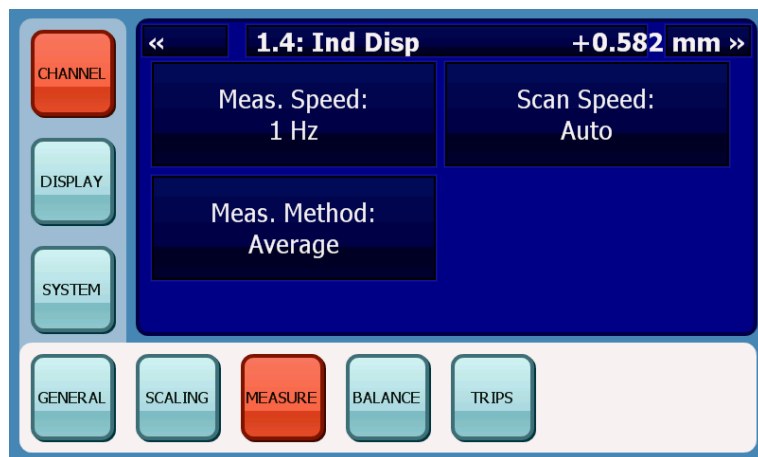
Button <MEASURE>

Meas. Speed: 1Hz

This step is important before <SCALING>, to make sure measurement data is available for calibrating the transducer

TIP

Use a low measurement speed for optimal results



Before calibration please check the following:

The inductive displacement transducer should be positioned as close as possible to its mechanical center position, so it can be displaced symmetrically from that point.

Set a starting point on the micrometer screw. In the example shown this is at exactly 15 mm.

Now turn the micrometer screw inwards for 2 mm.
(position: 13 mm)



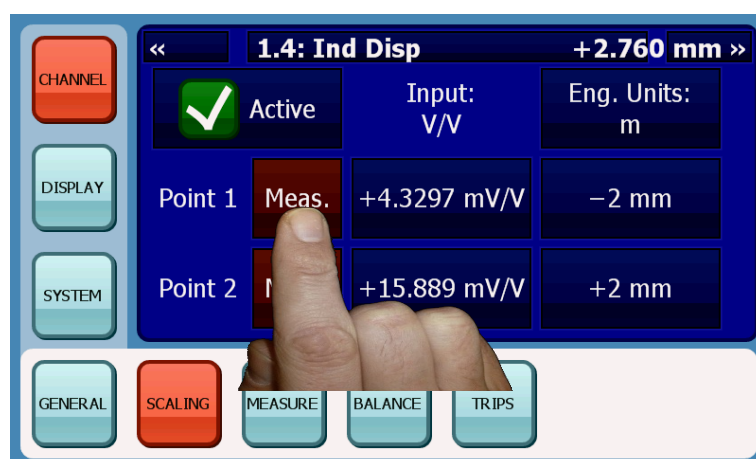
Button <SCALING>

Activate scaling

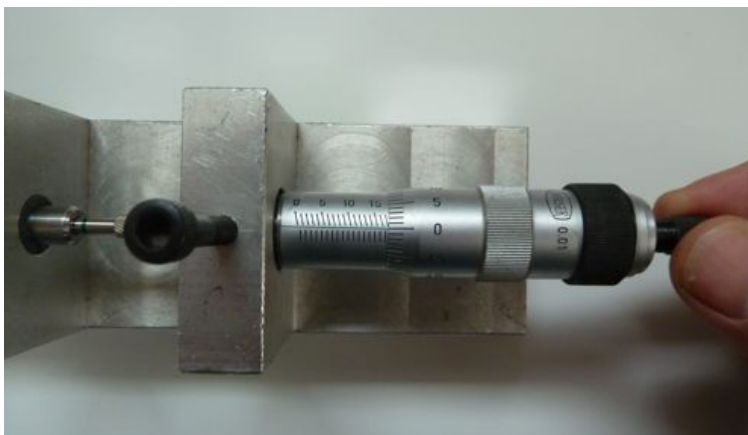
Select **Eng. Units: m**

For Point 1: enter -2mm

Point 1: Press <Meas.>

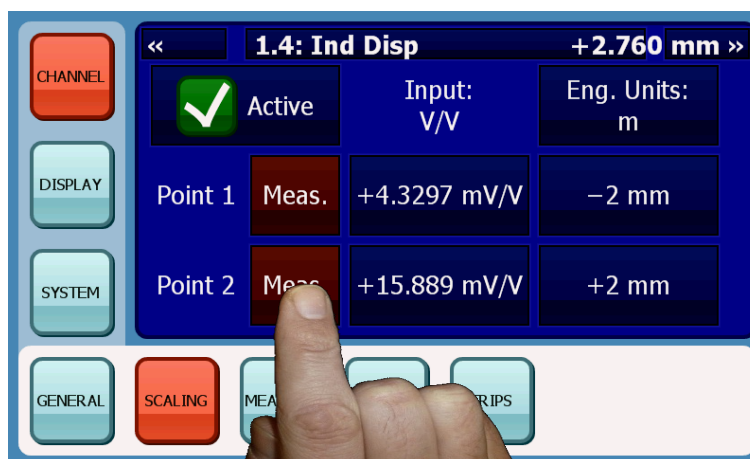


Now turn the micrometer screw outwards for 2 mm.
(seen from the 15 mm. starting position)



For Point 2: enter +2mm

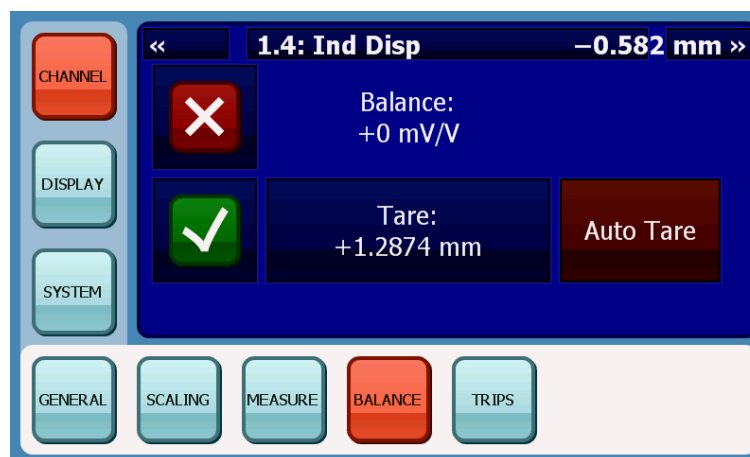
Point 2: press <Meas>



Button <BALANCE>

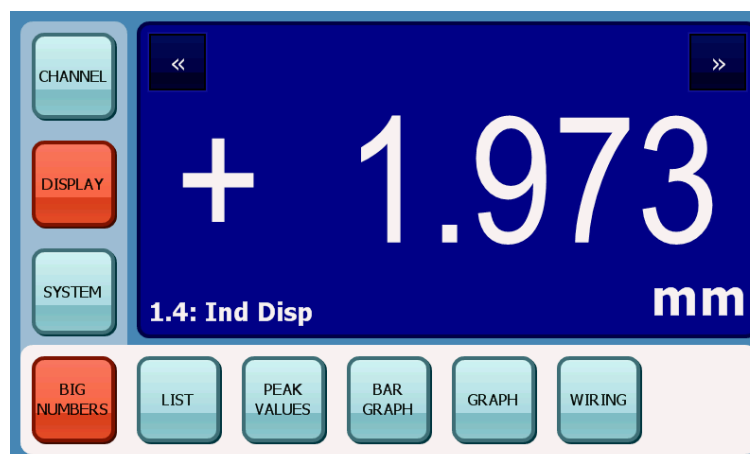
Activate Tare

Press button <Auto Tare>



Checking the result

Button <DISPLAY>



3.5 Measurement with Thermocouple Type K

To measure a thermocouple it is essential to define a CJC (cold junction compensation) measurement point beforehand. This cold junction compensation corrects for the temperature of the connection point, where the thermo-wires are connected to copper.

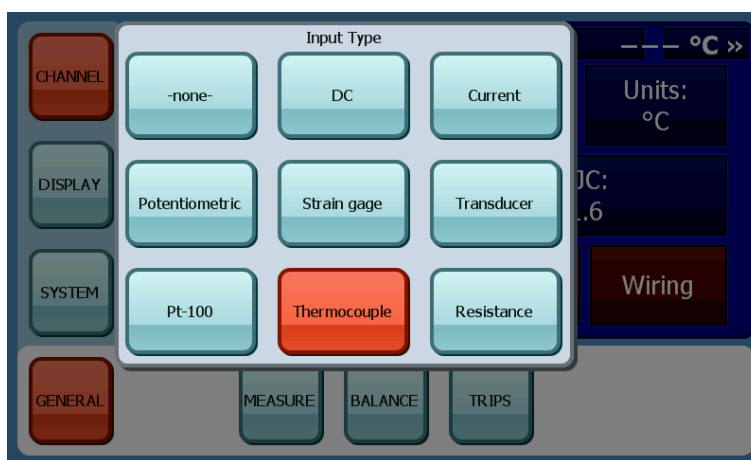
Note: For this purpose, Peekel offers a special connection board (type CJC11) with screw terminals. This board contains a solid block of aluminum with a built-in Pt-100 sensor. The block has a close thermal connection to the screw terminals and its mass ensures extra inertia reducing temperature fluctuations.

Procedure:

Use the button <CHANNEL> to select the channel to configure.

Menu: **Input Type**

Select *Thermocouple*



Select **Type: K**

CJC: always select one; the channel must be configured as a Pt-100 input

Burn-out activates the burn-out detection. This ensures that a broken thermocouple shows a defined value.



3.6 Storing the parameters in the device

When all settings are done and the channels are tared it is time to store the parameters. PICAS Touch has 4 memory areas (Setup 1 ... 4) available for this purpose.

Note: The Setup saved last is always the start setup, which will be active after switching on the device. This setup is marked with a “*”.

Procedure:

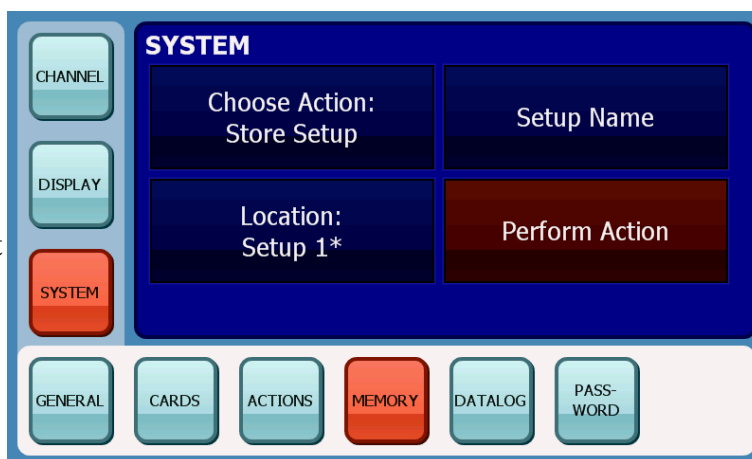
Use buttons <SYSTEM> / <MEMORY>

Choose Action

Select *Store Setup* and push <Perform Action>

Other actions include loading a store setup, or loading the default settings.

Under *Setup Name* you can enter your own name for the setup.



3.7 Storing measurement values in the device

PICAS Touch can record measurement data without the use of a PC. For this purpose it contains a flash memory of 500 Mb. Additionally, it contains an SD slot for the use of an SD(HC) memory card.

Note: Storage of measurement values on an SD card is limited to max. 5000 values/second overall. For faster measurements, the internal memory should be used.

Note: The following formula helps to calculate the memory requirements for storing data:
 $(2 + \text{channels} * 4)$ per measurement + $(28 + \text{channel} * 2)$ header data.

E.g.: 10 channels @ 100Hz each, in internal memory 500 Mb
 $(2 + 10 * 4) * 100 = 4200$ bytes/sec.

This leads to a total storage time of : $500 \text{ Mb} / 4200 \text{ byte} = 33$ hours

Procedure to configure logging:

Use buttons <SYSTEM> / <DATALOG>

Settings

Select *Group 1*

Channels

select the channels to log

Interval:

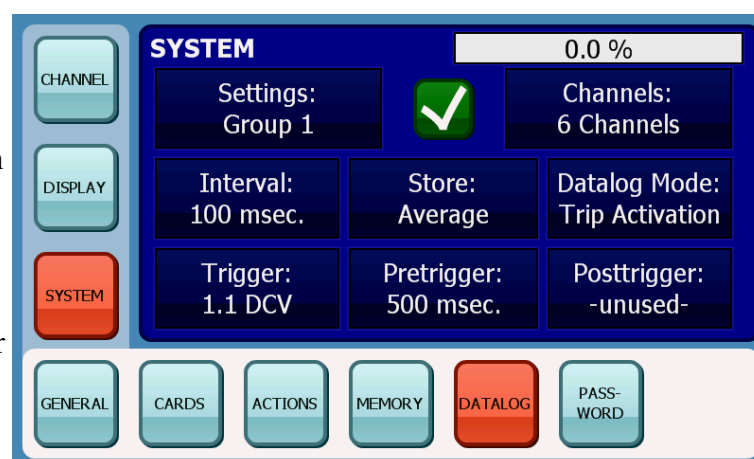
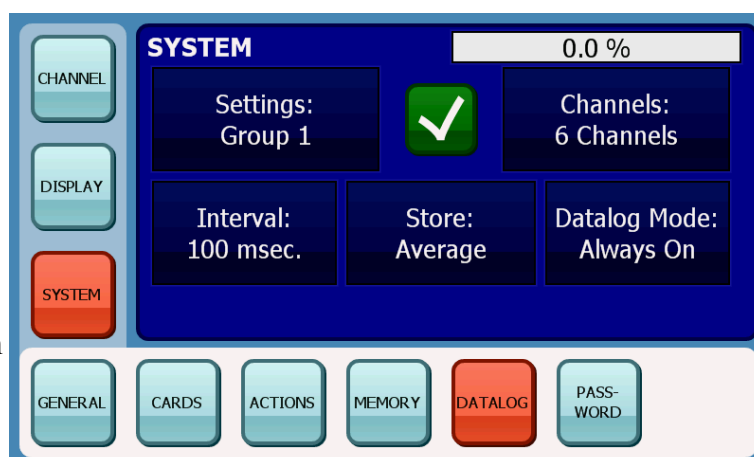
Select storage interval for this group. This can be different from the measurement speed of the individual channels. Usually it will be slower, to save memory space.

Store:

If the interval is slower than the meas. speed of the channels, then you can select which values should be stored here.

Datalog Mode:

Select between storing always, or storing only if a trip occurs. A single channel can be selected as the trigger source; a trip must be defined on this channel.

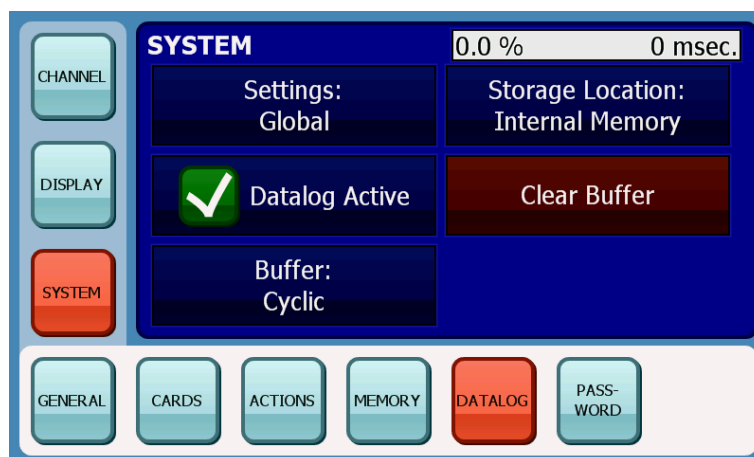


Settings

Select *Global*

This is the central location for activating all groups and setting the storage location (internal or SD card).

For SD card, there is no circular **Buffer** or option to clear it.



To retrieve stored data from the device, you can use the Autolog 3000 Configurator software (see chapter 9 for details).

4 Autolog 3000 and PICAS Touch cards

4.1 CA3460 input card

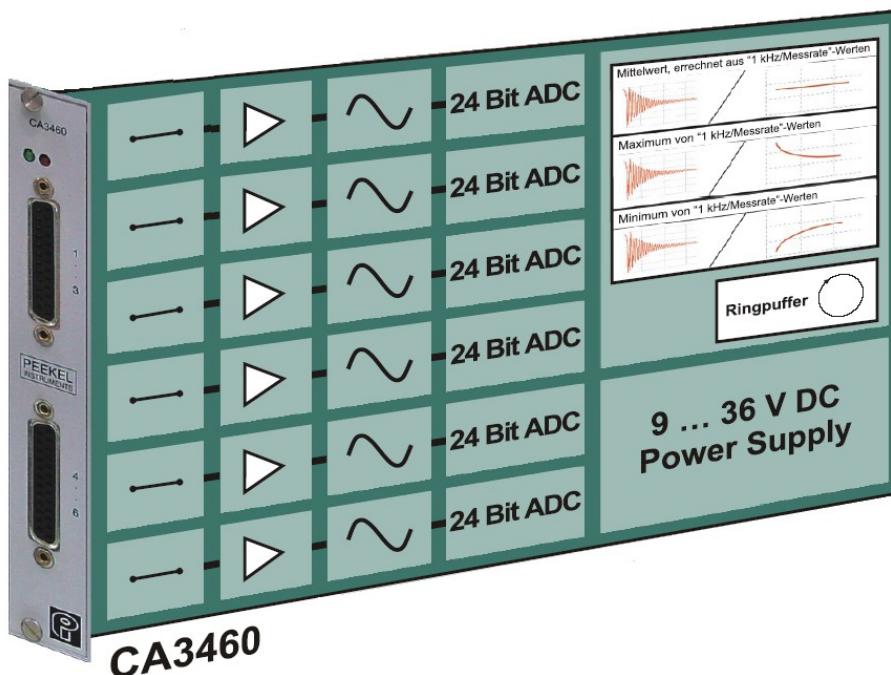
The CA3460 is a 6-channel DC input card for the Autolog 3000/PICAS Touch system. It is designed to be used for high-accuracy experimental and industrial measurements and can be used with a variety of Wheatstone bridge-based sensors and DC input signals. This card contains 6 individual channels, and the card can be used in the AUTOLOG 3000 multi-channel system.

4.1.1 General design principles

In principle the CA3460 is a standalone 6-channel measuring system. The following functions are integrated on the card:

- a separate amplifier/conditioner for each channel including an A/D converter
- a microprocessor which controls the card hardware and reads the converted signal values from the AD converters
- DC/DC-converter which converts the large input range (9...36VDC) to the on-board necessary supply voltages
- CAN interface for the communication with an external system. The communication with an internal controller (USB or Ethernet) uses a faster internal bus.

The following drawing only shows the basic principles of the electronics, as it is outside the scope of this user's manual to go into full detail.



The CA3460 is the base board which can hold 2 optional extension boards.

4.1.1.1 Basic measurement

With the base board the following signals can be measured:

1	Voltage signals:	$\pm 40\text{mV}$, $\pm 2\text{V}$ or $\pm 10\text{V}$ range
2	Current signals:	$\pm 50\text{ mA}$ range
3	Potentiometer	0 – 100% range
4	PT100	-200°C - $+590^{\circ}\text{C}$
5	Thermocouple type B	$+250^{\circ}\text{C}$ - $+1820^{\circ}\text{C}$
6	Thermocouple type E	-200°C - $+1000^{\circ}\text{C}$
7	Thermocouple type J	-200°C - $+1200^{\circ}\text{C}$
8	Thermocouple type K	-200°C - $+1370^{\circ}\text{C}$
9	Thermocouple type N	-200°C - $+1300^{\circ}\text{C}$
10	Thermocouple type R	-50°C - $+1760^{\circ}\text{C}$
11	Thermocouple type S	-50°C - $+1760^{\circ}\text{C}$
12	Thermocouple type T	-200°C - $+400^{\circ}\text{C}$
13	Full Wheatstone bridge:	$\pm 8\text{mV/V}$ or $\pm 400\text{mV/V}$

For the excitation of the potentiometer and full bridge measurement a 2,5V supply is present. The PT100 and resistor measurement is done with a ratio measurement to an on-board reference resistor. The maximum current through the resistor to be measured is about 250uA.

On the CA3460 2 optional extension boards can be mounted. Each of these boards will extend the signals which can be measured for 3 channels. The first extension board handles channel 1, 2 and 3, and the second extension board handles channel 4, 5 and 6.

4.1.1.2 Option 1 measurements

This extension board is used when bridge configurations other than the standard full bridge configuration must be measured, usually for strain gauge measurements. With this extension the following measurement configurations are added to the CA3460:

- Full bridge
- Half bridge
- Quarter bridge 120 Ω
- Quarter bridge 350 Ω
- Quarter bridge 1000 Ω

All these configurations will use the sense lines, to compensate the voltage drop over the wires used for the excitation of the external bridge. Full and half bridge configurations use a 6-wire connection, **quarter bridge uses a 4-wire connection.**

The excitation for the bridge is adjustable in steps of 0,5V from 0,5V up to 5V.

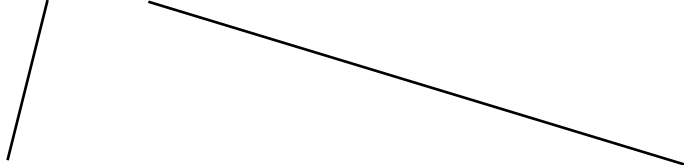
The maximum current for this excitation is 50 mA. When the current is above this level, the excitation voltage will automatically be reduced until the current is below 50 mA.

The measurement ranges are the same as on the base board. A selection can be made between $\pm 40\text{mV}$ and $\pm 2\text{V}$.

For bridge measurements the ranges are normally notated in mV/V, for strain gauge measurements $\mu\text{m/m}$ is used.

Some example values:

Input range	$\pm 40\text{mV}$	$\pm 2\text{V}$
Excitation		
0,5V - 5V	$\pm 8 \text{ mV/V}$	$\pm 400 \text{ mV/V}$



Input range	Full bridge K-factor = 2	Half bridge K-factor = 2	Quarter bridge K-factor = 2
Excitation	Bridge factor=4	Bridge factor=2	Bridge factor=1
0,5V - 5V	$\pm 3800 \text{ um/m}$	$\pm 7700 \text{ um/m}$	$\pm 15000 \text{ um/m}$

Note:

In the software from Peekel Instruments, the calculation of the available measurement range is done automatically, based on the settings (like excitation voltage) used, only the resulting range is shown.

4.1.1.3 Option 2 measurements

This extension board is used when LVDT sensor must be measured. With this extension the following measurement configurations are added to the CA3460:

- Full bridge LVDT
- Half bridge LVDT

All these configurations will use the sense lines, to compensate the voltage drop over the wires used for the excitation of the external bridge.

The excitation for the bridge is fixed 4V_{rms} with a frequency of 5kHz.

The maximum current for this excitation is 50 mA.

4.1.1.4 Card LED's

On the front of the card a red and a green LED are present. Those LED's have the following meaning:

Red LED: lights up when the card is on and correctly functioning

Green LED: lights up when communication to an external system is present

Note:

If the Autolog 3000 contains a built-in USB-controller, then the green LEDs will light up as soon as the device is connected through its USB interface and correctly recognized by the PC.

The PICAS Touch has a built-in Ethernet/USB-controller. Therefore, the green LEDs will light up as soon as the device is switched on.

4.2 CM3410 input card

The CM3410 is a DC input card for the Autolog 3000 / PICAS Touch system.

It is designed to be used for high-accuracy experimental and industrial measurements and can be used with a variety of Wheatstone bridge-based sensors and DC input signals. This card contains 1 individual channel identical as on the CA3460 card, extended with a multiplexer. This means the card offers up to 36 input channels. Every input channel can measure almost every type of sensor, from DCV/current and Thermocouples up to strain gauge bridges.

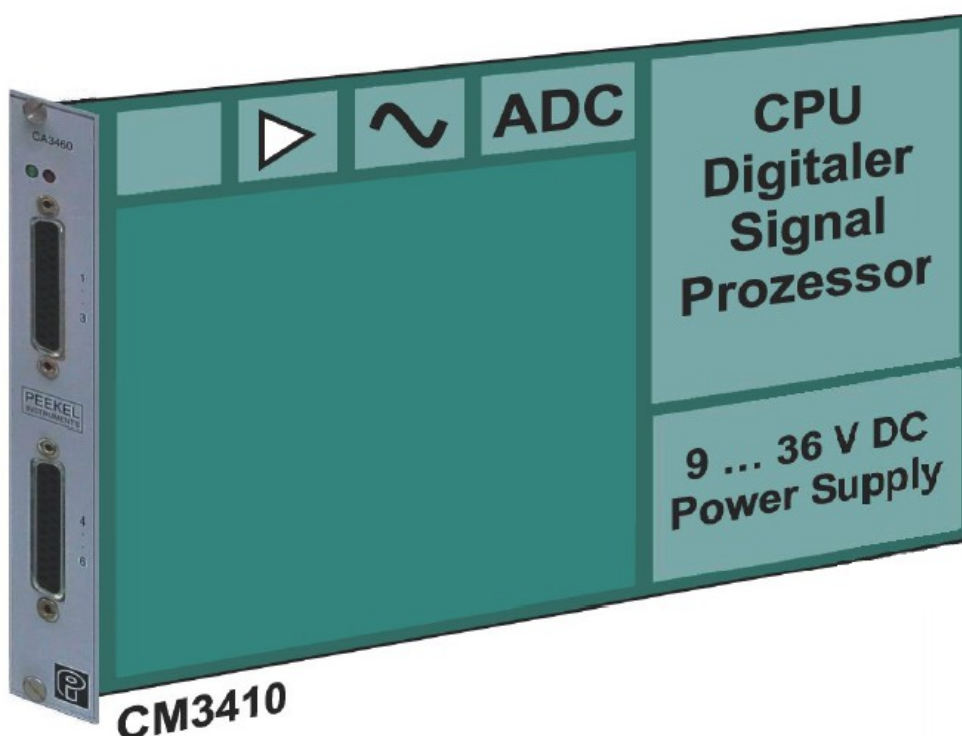
The card can be used in the AUTOLOG 3000 multi-channel system.

4.2.1 General design principles

In principle the CM3410 is a standalone measuring system. The following functions are integrated on the card:

- a separate amplifier/conditioner including an A/D converter
- Multiplexer with 72 contacts (PhotoMOS-Relais); combined measurement speed: max. 200Hz
- a microprocessor which controls the card hardware and reads the converted signal values from the AD converter
- Power supply which converts the large input range (9...36 VDC) to the on-board necessary supply voltages
- CAN interface for the communication with an external system. The communication with an internal controller (USB or Ethernet) uses a faster internal bus.

The following drawing only shows the basic principles of the electronics, as it is outside the scope of this user's manual to go into full detail.



4.2.1.1 Basic measurement

With the base board the following signals can be measured:

- Voltage signals: $\pm 40\text{mV}$, $\pm 2\text{V}$ or $\pm 10\text{V}$ range
- Potentiometer 0 – 100% range
- PT100 -200°C - $+590^{\circ}\text{C}$
- Thermocouple type B $+250^{\circ}\text{C}$ - $+1820^{\circ}\text{C}$
- Thermocouple type E -200°C - $+1000^{\circ}\text{C}$
- Thermocouple type J -200°C - $+1200^{\circ}\text{C}$
- Thermocouple type K -200°C - $+1370^{\circ}\text{C}$
- Thermocouple type N -200°C - $+1300^{\circ}\text{C}$
- Thermocouple type R -50°C - $+1760^{\circ}\text{C}$
- Thermocouple type S -50°C - $+1760^{\circ}\text{C}$
- Thermocouple type T -200°C - $+400^{\circ}\text{C}$
- Full bridge
- Half bridge
- Quarter bridge 120 Ω
- Quarter bridge 350 Ω
- Quarter bridge 1000 Ω

The excitation supply for the bridge measurements is adjustable between 0,5VDC and 5VDC. At 5 V excitation, the smallest resistance value that can be connected is 120 Ohms.

The PT100 and resistor measurement is done with a ratio measurement to an on-board reference resistor. The maximum current through the resistor to be measured is about 250uA.

4.2.1.2 Multiplexer

The multiplexer can be used to connect more channels to the single input channel. This input channel is the same as on the CA3460 and will use 8 wires for complete channel connection.

Those 8 wires are used for the next signals:

- Excitation supply (V_{exc+} and V_{exc-})
- Sense signal ($Sense+$ and $Sense-$)
- Input signal ($Input+$ and $Input-$)
- TEDS interface ($SI+$ and $SI-$)

All these signals are only used when a full bridge with TEDS information is used.

On the CM3410 9 of these channels can be connected.

When no TEDS is used, only 6 wires are required to connect a full bridge. Due to the flexibility of the multiplexer 12 of those channels can be connected.

A further increase of connecting channels will be the case when 4 wire or 2 wire measurements are used.

So a selection can be made between 8, 6, 4 or 2 wire measurements, which result in 9, 12, 18 or 36 signals to be connected to just 1 CM3410.

Due to this multiplexer layout, the function of an input pin on 1 of the 2 connectors will change when another type of connection is selected. When a 2 wire interface is selected, all pin-pairs will be switched to the channel input circuit. When a 6 wire interface is selected some pin-pairs will be

switched to the excitation supply. **Take care with this selection, because it is possible that excitation supply is set to connector pins, due to the chosen multiplexer setting. When in this case a thermocouple is connected to these pins, this thermocouple could short circuit the excitation supply, which could damage the thermocouple.**

The setup of the multiplexer is done in 3 groups, which means the total number of 72 contacts is divided into 3 times 24 contacts. For each group the number of connecting wires for the channels belonging to this group is identical. Therefore, the number of channels available in each group is calculated as follows:

$$24 \text{ contacts} / x \text{ wires per channel} = \text{number of channels available}$$

A special case is present for thermocouple measurement. When the cold-junction is to be used with this measurement this temperature is measured with a PT100 sensor which is connected as a 4 wire input. This is the last channel in the third group. All other channels will be 2 wire connections, which means there are $2 \times 12 + 1 \times 10 = 34$ thermocouple connection plus 1 CJC connection.

The following tables show how inputs should be connected, depending on the number of wires used in each group of channels. Note that for the second group, pins on both connector 1 and 2 are used.

Connections for the 1st group, depending on the number of wires used:
 (Note: 1-3-xx signifies channel #3 in group #1, for example)

Conn nr	Conn. pin	Channel nr 8 wire conn	Channels nr 6 wire conn	Channel nr 4 wire conn	Channel nr 2 wire conn
1	19	1-1- Vexc+	1-1- Vexc+	1-1- Vexc+	1-1- Input+
1	37	1-1- Vexc-	1-1- Vexc-	1-1- Vexc-	1-1- Input -
1	18	1-1- Sense+	1-1- Sense+	1-1- Input+	1-2- Input+
1	36	1-1- Sense-	1-1- Sense-	1-1- Input -	1-2- Input -
1	17	1-1- Input+	1-1- Input+	1-2- Vexc+	1-3- Input+
1	35	1-1- Input -	1-1- Input -	1-2- Vexc-	1-3- Input -
1	16	1-1- SI+	1-2- Vexc+	1-2- Input+	1-4- Input+
1	34	1-1- SI-	1-2- Vexc-	1-2- Input -	1-4- Input -
1	15	1-2- Vexc+	1-2- Sense+	1-3- Vexc+	1-5- Input+
1	33	1-2- Vexc-	1-2- Sense-	1-3- Vexc-	1-5- Input -
1	14	1-2- Sense+	1-2- Input+	1-3- Input+	1-6- Input+
1	32	1-2- Sense-	1-2- Input -	1-3- Input -	1-6- Input -
1	13	1-2- Input+	1-3- Vexc+	1-4- Vexc+	1-7- Input+
1	31	1-2- Input -	1-3- Vexc-	1-4- Vexc-	1-7- Input -
1	12	1-2- SI+	1-3- Sense+	1-4- Input+	1-8- Input+
1	30	1-2- SI-	1-3- Sense-	1-4- Input -	1-8- Input -
1	11	1-3- Vexc+	1-3- Input+	1-5- Vexc+	1-9- Input+
1	29	1-3- Vexc-	1-3- Input -	1-5- Vexc-	1-9- Input -
1	10	1-3- Sense+	1-4- Vexc+	1-5- Input+	1-10- Input+
1	28	1-3- Sense-	1-4- Vexc-	1-5- Input -	1-10- Input -
1	9	1-3- Input+	1-4- Sense+	1-6- Vexc+	1-11- Input+
1	27	1-3- Input -	1-4- Sense-	1-6- Vexc-	1-11- Input -
1	8	1-3- SI+	1-4- Input+	1-6- Input+	1-12- Input+
1	26	1-3- SI-	1-4- Input -	1-6- Input -	1-12- Input -

Connections for the 2nd group, depending on the number of wires used:
 (Note: 2-3-xx signifies channel #3 in group #2, for example)

Conn nr	Conn. pin	Channel nr 8 wire conn	Channels nr 6 wire conn	Channel nr 4 wire conn	Channel nr 2 wire conn
1	7	2-1- Vexc+	2-1- Vexc+	2-1- Vexc+	2-1- Input+
1	25	2-1- Vexc-	2-1- Vexc-	2-1- Vexc-	2-1- Input -
1	6	2-1- Sense+	2-1- Sense+	2-1- Input+	2-2- Input+
1	24	2-1- Sense-	2-1- Sense-	2-1- Input -	2-2- Input -
1	5	2-1- Input+	2-1- Input+	2-2- Vexc+	2-3- Input+
1	23	2-1- Input -	2-1- Input -	2-2- Vexc-	2-3- Input -
1	4	2-1- SI+	2-2- Vexc+	2-2- Input+	2-4- Input+
1	22	2-1- SI-	2-2- Vexc-	2-2- Input -	2-4- Input -
1	3	2-2- Vexc+	2-2- Sense+	2-3- Vexc+	2-5- Input+
1	21	2-2- Vexc-	2-2- Sense-	2-3- Vexc-	2-5- Input -
1	2	2-2- Sense+	2-2- Input+	2-3- Input+	2-6- Input+
1	20	2-2- Sense-	2-2- Input -	2-3- Input -	2-6- Input -
2	19	2-2- Input+	2-3- Vexc+	2-4- Vexc+	2-7- Input+
2	37	2-2- Input -	2-3- Vexc-	2-4- Vexc-	2-7- Input -
2	18	2-2- SI+	2-3- Sense+	2-4- Input+	2-8- Input+
2	36	2-2- SI-	2-3- Sense-	2-4- Input -	2-8- Input -
2	17	2-3- Vexc+	2-3- Input+	2-5- Vexc+	2-9- Input+
2	35	2-3- Vexc-	2-3- Input -	2-5- Vexc-	2-9- Input -
2	16	2-3- Sense+	2-4- Vexc+	2-5- Input+	2-10- Input+
2	34	2-3- Sense-	2-4- Vexc-	2-5- Input -	2-10- Input -
2	15	2-3- Input+	2-4- Sense+	2-6- Vexc+	2-11- Input+
2	33	2-3- Input -	2-4- Sense-	2-6- Vexc-	2-11- Input -
2	14	2-3- SI+	2-4- Input+	2-6- Input+	2-12- Input+
2	32	2-3- SI-	2-4- Input -	2-6- Input -	2-12- Input -

Connections for the 3rd group, depending on the number of wires used:

(Note: 3-4-xx signifies channel #4 in group #3, for example)

Conn nr	Conn. pin	Channel nr 8 wire conn	Channels nr 6 wire conn	Channel nr 4 wire conn	Channel nr 2 wire conn	Channel nr 2 wire+CJC
2	13	3-1- Vexc+	3-1- Vexc+	3-1- Vexc+	3-1- Input+	3-1- Input+
2	31	3-1- Vexc-	3-1- Vexc-	3-1- Vexc-	3-1- Input -	3-1- Input -
2	12	3-1- Sense+	3-1- Sense+	3-1- Input+	3-2- Input+	3-2- Input+
2	30	3-1- Sense-	3-1- Sense-	3-1- Input -	3-2- Input -	3-2- Input -
2	11	3-1- Input+	3-1- Input+	3-2- Vexc+	3-3- Input+	3-3- Input+
2	29	3-1- Input -	3-1- Input -	3-2- Vexc-	3-3- Input -	3-3- Input -
2	10	3-1- SI+	3-2- Vexc+	3-2- Input+	3-4- Input+	3-4- Input+
2	28	3-1- SI-	3-2- Vexc-	3-2- Input -	3-4- Input -	3-4- Input -
2	9	3-2- Vexc+	3-2- Sense+	3-3- Vexc+	3-5- Input+	3-5- Input+
2	27	3-2- Vexc-	3-2- Sense-	3-3- Vexc-	3-5- Input -	3-5- Input -
2	8	3-2- Sense+	3-2- Input+	3-3- Input+	3-6- Input+	3-6- Input+
2	26	3-2- Sense-	3-2- Input -	3-3- Input -	3-6- Input -	3-6- Input -
2	7	3-2- Input+	3-3- Vexc+	3-4- Vexc+	3-7- Input+	3-7- Input+
2	25	3-2- Input -	3-3- Vexc-	3-4- Vexc-	3-7- Input -	3-7- Input -
2	6	3-2- SI+	3-3- Sense+	3-4- Input+	3-8- Input+	3-8- Input+
2	24	3-2- SI-	3-3- Sense-	3-4- Input -	3-8- Input -	3-8- Input -
2	5	3-3- Vexc+	3-3- Input+	3-5- Vexc+	3-9- Input+	3-9- Input+
2	23	3-3- Vexc-	3-3- Input -	3-5- Vexc-	3-9- Input -	3-9- Input -
2	4	3-3- Sense+	3-4- Vexc+	3-5- Input+	3-10- Input+	3-10- Input+
2	22	3-3- Sense-	3-4- Vexc-	3-5- Input -	3-10- Input -	3-10- Input -
2	3	3-3- Input+	3-4- Sense+	3-6- Vexc+	3-11- Input+	3-11- Vexc +
2	21	3-3- Input -	3-4- Sense-	3-6- Vexc-	3-11- Input -	3-11- Vexc -
2	2	3-3- SI+	3-4- Input+	3-6- Input+	3-12- Input+	3-11- Input+
2	20	3-3- SI-	3-4- Input -	3-6- Input -	3-12- Input -	3-11- Input -

4.3 CA3520 Carrier Frequency input card

The CA3520 is a 2-channel CF input card for the Autolog 3000/PICAS Touch system. It is designed to be used for high-accuracy experimental and industrial measurements and can be used with a variety of Wheatstone bridge-based sensors and strain gauge input signals. This card contains 2 individual channels, and the card can be used in the AUTOLOG 3000 multi-channel system.



4.3.1 The Carrier Frequency principle

High-accuracy measuring at the output of passive transducers is usually configured into some sort of a Wheatstone Bridge circuit which always needs some form of reference (bridge supply) voltage.

DC bridge supply is by far the most popular for resistive transducers, but when it comes to the highest sensitivity, DC might introduce different spurious voltages which makes the measuring unreliable. In the late 1950's Peekel Instruments already developed the Carrier Frequency principle for these applications, where an AC voltage is being used for the supply, which eliminates most of these spurious and misleading signals. Furthermore, AC bridge supply can be also used together with capacitive and inductive transducers.

If dynamic signals are being measured, the AC bridge supply voltage will be “modulated” by the measuring signal and by “detecting” this signal, the output signal becomes available. This way of measuring, through modulation of a carrier frequency with detection in a later step, is similar to the principle of AM radio. Hence, the term “Carrier Frequency” is being used.

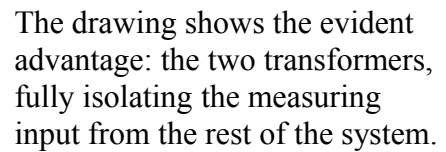
The inherent use of isolation transformers assures a complete isolation between the sensing circuit and the rest of the system.

4.3.2 General design principles

In principle the CA3520 is a standalone 2-channel measuring system. The following functions are integrated on the card:

- a separate 5 kHz carrier frequency amplifier/conditioner for each channel including an A/D converter
- a microprocessor which controls the card hardware and reads the converted signal values from the AD converters
- DC/DC-converter which converts the large input range (9...36VDC) to the on-board necessary supply voltages
- CAN interface for the communication with an external system. The communication with an internal controller (USB or Ethernet) uses a faster internal bus.

The following drawings only show the basic principles of the carrier frequency amplifier, as it is outside the scope of this user's manual to go in full detail.



Green LED: lights up when communication to an external system is present

Note:

If the Autolog 3000 contains a built-in USB-controller, then the green LEDs will light up as soon as the device is connected through its USB interface and correctly recognized by the PC.

The PICAS Touch has a built-in Ethernet/USB-controller. Therefore, the green LEDs will light up as soon as the device is switched on.

4.4 CD3733 Digital In- output card

The CD3733 is a in- and output card for the Autolog 3000 system. It is designed to be used for 24VDC optoisolated status inputs and solid state relay outputs.

The card can be used in the AUTOLOG 3000 multi-channel system.

4.4.1 General design principles

In principle the CD3733 is a standalone measuring system. The following functions are integrated on the card:

- 16 digital status inputs, opto isolated
- 12 digital status outputs, solid state contact
- 2 digital status output with a NO-NC relay contact
- a microprocessor which controls the card hardware
- Power supply which converts the large input range (9...36 VDC) to the onboard necessary supply voltages
- CAN interface for the communication with an external system. The communication with an internal controller (USB or Ethernet) uses a faster internal bus.



4.5 PB3100 Communication Card

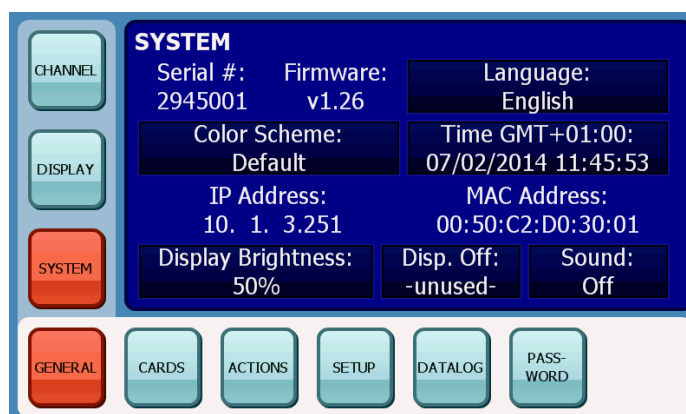
The PB3100 communication card is a required part of the PICAS Touch and Autolog 3000 in HCA3004 or HCA3016 housing. It offers an Ethernet connection (recommended for general use), a USB connection, and internal flash memory and SD card slot for data logging.



4.5.1 Ethernet communication

The PB3100 has a standard RJ45 jack for Ethernet communication. It can be connected to a network using a switch (recommended), or directly to a PC using a cross-cable. To be able to communicate, the PB3100 must have a suitable IP address, matching the rest of the network. The PB3100 can acquire this address automatically from a DHCP server in the network, or a fixed address can be configured. Refer to chapter 2.6 for more information about connecting and configuring the IP address.

When using the PICAS Touch, the current IP address of the PB3100 is visible in the display (menu SYSTEM – GENERAL).



4.5.1.1 Built-in webserver

The PB3100 has a built-in webserver, which can only be used if the device is connected to Ethernet. To use this webserver, open a web browser on the PC and use the IP address of the PB3100 to access it. Most of the settings available on the PICAS Touch display can also be made using this webserver, with a similar look and feel. Refer to chapter 2.6.2 for more information.

4.5.2 USB communication

Although Ethernet is the recommended way to communicate with the PB3100, a USB connector is also available. To use the device with USB, a suitable driver must be installed on the PC. Refer to chapter 2.6.3 and 2.6.4 for more information about installing the driver.

4.5.3 Real Time Clock

The PB3100 has its own internal real time clock. On the PICAS Touch, the current date and time from this clock is visible in the display (menu SYSTEM – GENERAL). The date and time can be changed by tapping the field. Note that the internal time of the PB3100 is always UTC/GMT, and a separate time zone offset is stored. All measurement data gets timestamped using UTC time, independent of the time zone offset.

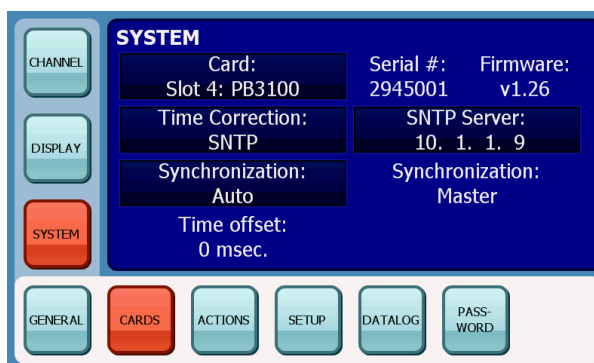


Beware: the real time clock in the PB3100 is not backed up by a battery, but by a capacitor. This means that when the PB3100 has no power, it will only retain the correct date and time for about 5 days. After that, the real time clock will no longer be updated, so the PB3100 will show an incorrect (old) time when it is switched on after prolonged non-use.

4.5.4 Time synchronisation

Like with most other devices, the real time clock PB3100 runs on a crystal with limited accuracy, with can cause the internal time to drift away from the actual time by several seconds each day.

When performing online measurements with the PB3100, in combination with data acquisition software like Autosoft 3000, the real time clock will be synchronised with the PC time by default.



Other options for time synchronisation can be found under the SYSTEM – CARDS menu (PICAS Touch display), after selecting the PB3100 card. The “Time Correction” setting tells the PB3100 how to correct its real time clock. The default setting “Internal/PC” means the PB3100 does nothing, and waits for time information from controlling software like Autosoft 3000 (as described above).

4.5.4.1 SNTP time server

The “Time Correction” setting “SNTP” means the PB3100 will synchronise its time using an external SNTP server, for which the IP address must be configured. When SNTP time synchronisation is active, the PB3100 will request the current time from the specified SNTP server once every second. It will keep statistics during a full minute, and then determine the time offset and rate of change. While acquiring the first data (which can take several minutes), the “Time offset”-field will show “Unknown/Invalid”. After that, an indication of e.g. “+10 ± 2 msec.” shows that the time offset compared to the SNTP server is about 10 msec. with a margin of error of plus or minus 2 msec.

Leaving the PB3100 synchronised with an SNTP server for longer periods of time will increase the accuracy. Using a proper time server, a margin of error of less than 2 msec. is achievable. Note that the time server supplied in a standard Windows PC is not that accurate (+/- 15 msec.) and should best not be used for this purpose.

To keep the internal time synchronised, the PB3100 will make small modifications to the speed at which the internal clock runs. This means that after the initial synchronisation period (which can take an hour or more), the clock will run at the exact same speed as the time server, and measurements are performed at the exact interval specified.

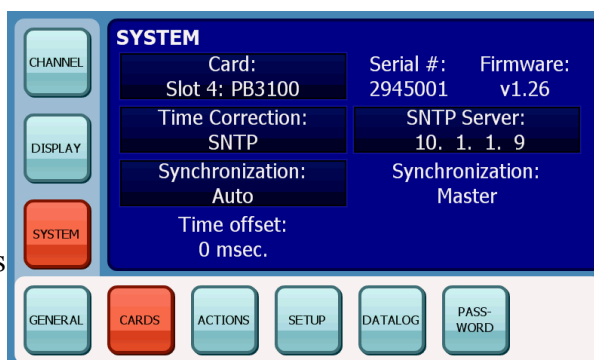
Important: refer to chapter 4.5.7 if you want to make these settings permanent.

4.5.4.2 Synchronising multiple PB3100 cards

When dealing with multiple measurement devices with PB3100, the preferred way to synchronise them is to use a central time server (SNTP) as described above, and have each individual PB3100 obtain its time from that server.

This method does have its limitations, and in situations where the synchronisation must be exact (less than 2-3 msec. difference), a synchronisation cable can be used to connect the PB3100 systems. A 1 kHz synchronisation signal will then be exchanged between the cards, including an accurate time stamp once each minute, to guarantee all PB3100 run at exactly the same speed and have no more than 1 msec. difference in time stamps.

It is advisable to set the “Synchronization” of one of the PB3100 cards to “Master”, and the others to “Slave”. The synchronisation signal will be generated by the master card and read by the slaves. The master card can in turn be configured to retrieve its time from an SNTP server, as described before. The default “Auto”-setting means the cards will choose their own role, where the current choice is shown on the right.



Important: refer to chapter 4.5.7 if you want to make these settings permanent.

In situations where the systems are too far apart (long synchronisation cable needed), or the synchronisation signal is likely to be influenced by electrical noise from the environment, the software-based SNTP synchronisation is the most reliable approach.

4.5.5 Datalogging

The PB3100 can be used to perform stand-alone data logging. For this purpose it has an internal NAND flash memory of 512 Mb, and an SD card slot for external storage. For SD card storage, use a good quality SD or SDHC card, which must be FAT-formatted (default for most cards). Note that extra high capacity SDXC cards are not supported. After inserting the SD card, you can check if it is correctly detected using the SYSTEM – CARDS menu.

SD cards can not be used for high-speed measurements, the total storage rate is limited to about 5.000 measurement values per second. For faster storage, use the internal NAND flash memory.

For more information about the configuration of the stand-alone datalog function, please refer to chapter 3.7.

4.5.6 Passwords and security

By default, the PB3100 allows all settings to be changed, either using the PICAS Touch display, or the built-in webserver. When the device is used in an online measurement (controlled by e.g. Autosoft 3000), this function is blocked to prevent configuration changes that might influence a running measurement.

To limit access to settings in stand-alone operation, use the SYSTEM – PASSWORD menu. There are three different access levels:

Look: all settings can be viewed, but no changes are allowed

Edit: all settings can be viewed, but not every change is allowed. Use the “Edit Access” function to select which actions are allowed with “Edit” access.

Full: all settings can be viewed and changed.

The “Webserver Access” setting determines the **maximum** access level allowed through the web server. Higher level can never be accessed through the web interface (even with the correct password), but for lower levels a password may still be needed.

Important: if you set the “Webserver Access” level to “None”, the webserver will be completely disabled. Save the setup, and switch the device OFF/ON to disable the webserver in this way.

To limit access by a password, determine what level of access you want to grant in all cases (no password needed). For example, if “Look” is always allowed, set a password for the next higher level (“Edit”). Do this by first changing the “Change Password for” field to “Edit”, and then filling in the new password under “New Password”. A password is a four-digit code.

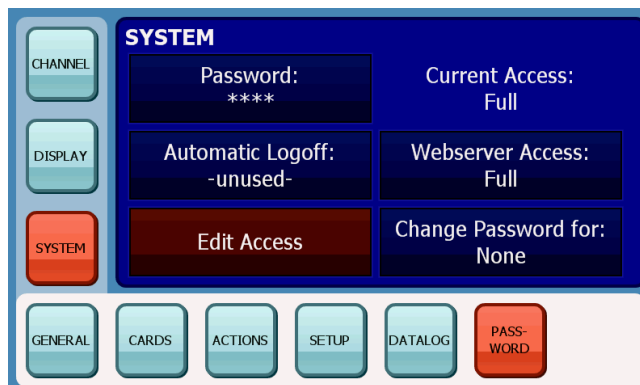
To remove a password, change it to the default value “0000”.

Beware: make sure you remember the password you set in the device, otherwise you may lose access to its settings!

After setting the password, the top-right field will show “Log Off: Full”. This means that your current access level is “Full”. After log off, you will only have “Look” access until you enter the password in the “Password” field. Then you will have “Full” access, since only the “Edit” level has a password, granting access to every level above it. Try this after setting a password, to make sure it is set correctly, before saving the setup.

Use the “Automatic Logoff” option to make the device lock its settings automatically if it is not used for the specified amount of time.

Important: refer to chapter 4.5.7 if you want to make these settings permanent. Otherwise, just switching the device OFF/ON will make it forget about the password settings!



4.5.7 Saving Setups

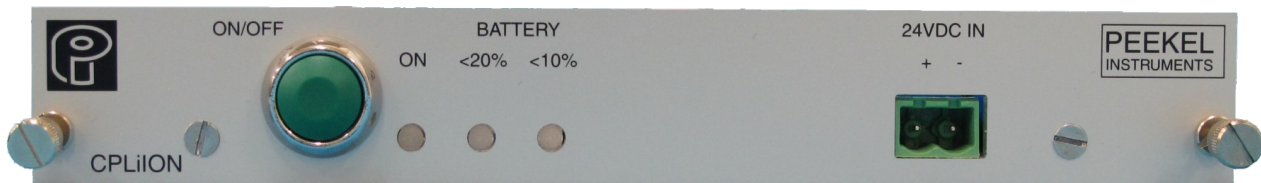
When making changes to the configuration of the PB3100, be aware that most information will be lost as soon as the power is switched off. To store settings permanently, use the SYSTEM – SETUP menu.

Here, a maximum of 4 different setups can be stored. To store a setup, make sure the “Choose Action” field is set to “Store Setup”. Then, optionally, give a name to the setup using the “Setup Name” field. Choose one of the four locations to store the setup in, then do “Perform Action”. The current settings are saved, and the chosen location is now the default startup set (marked by a “*”). This means that after power on, the PB3100 will load its settings from this location.

The screenshot shows the 'SYSTEM' menu interface. On the left is a vertical sidebar with four buttons: 'CHANNEL' (light blue), 'DISPLAY' (light blue), 'SYSTEM' (orange), and 'GENERAL' (light blue). The main area is titled 'SYSTEM' in white on a dark blue background. It contains four fields: 'Choose Action: Store Setup' (dark blue), 'Setup Name' (dark blue), 'Location: Setup 2' (dark blue), and 'Perform Action' (dark red). At the bottom is a horizontal row of six buttons: 'GENERAL' (light blue), 'CARDS' (light blue), 'ACTIONS' (light blue), 'SETUP' (orange), 'DATALOG' (light blue), and 'PASS-WORD' (light blue).

4.6 CP-LiION Battery Card

To operate the PICAS Touch without 230V power, the CP-LiION battery card is available. The capacity of this card is 2.5 Ah. The operating time of the device depends on the configuration (number and type of measurement cards). A device with 2x CA3460 cards, for example, can run for about 2.5 hours.



4.6.1 Operating the device on CP-LiION battery

To run the device on batteries, first switch off/remove the main power (230 VAC). Then press the ON/OFF button on the battery card for about 2 seconds. Then the green LED will light to indicate that the battery card supplies power to the system.

To stop running on batteries push the ON/OFF button again, for about 3 seconds, and the green LED will turn off.

The yellow and red LED show the condition of the battery card:

Yellow LED:	ca. 10-15 min. until the device switches off
Red LED:	ca. 5 min. until the device switches off

4.6.2 Charging the CP-LiION Battery Card

The battery card can be charged using the integrated 230 VAC power. Connect the device to 230 VAC and switch it on. The LED's on the battery card will not yet light. Now press and hold the ON/OFF button on the battery card until the yellow LED starts to blink. The charge cycle starts. The charge time is max. 5 hours, and will end automatically (yellow LED switches off). The charge sequence can be interrupted by pressing the ON/OFF button for ca. 2-3 sec.

Note:

The 2-pins connector on the right side of the battery card allows for the connection of an external DC power source (not included). This power source should supply at least 24 VDC @ 2A. Nevertheless it is advisable to charge the battery using the built-in 230 VAC power supply!

!Warning!

Be careful in case you ever need to remove the battery card from the device. The batteries can hold charge and damage the electronics in case of a shortage!

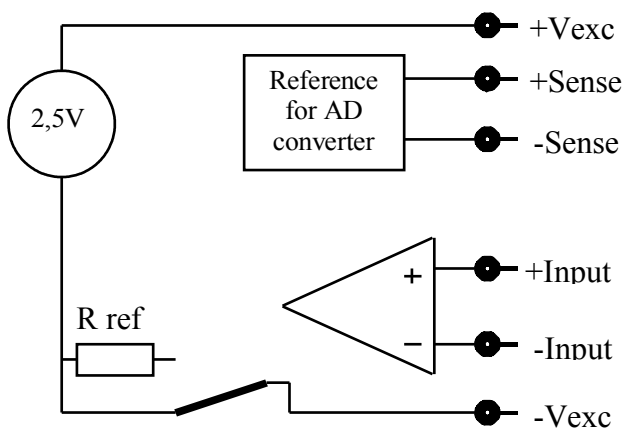
5 Signal connections and schematics

To clarify how input signal are handled by the hardware of the input cards, a short overview is presented for each type of sensor.

Connections are drawn simplified for clarity.

5.1 Signal connection CA3460 and CM3410 board

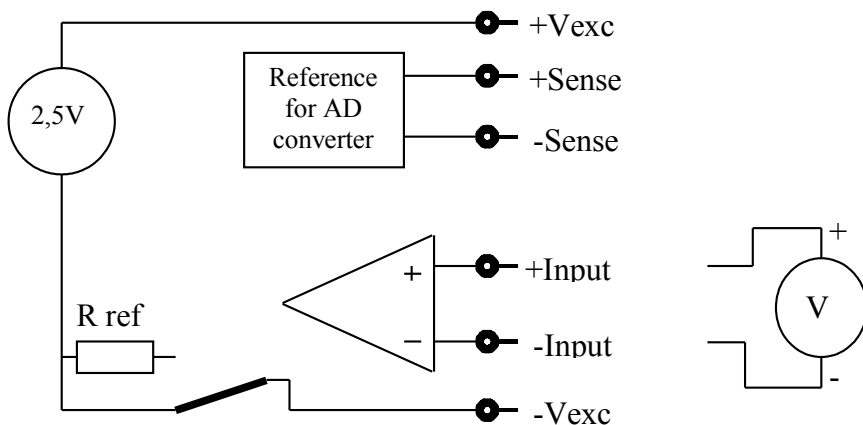
Each input has the following internal connections:



Notes to the sensor cable:

1. In order to reduce the noise, all the connections to the input must be made with **screened cable**. The cable screen must be connected in a proper way to the cable connector metal housing.
2. It is preferred to use **twisted pairs** for the signal pairs (Vexc, input, sense).

5.1.1 Voltage input connection

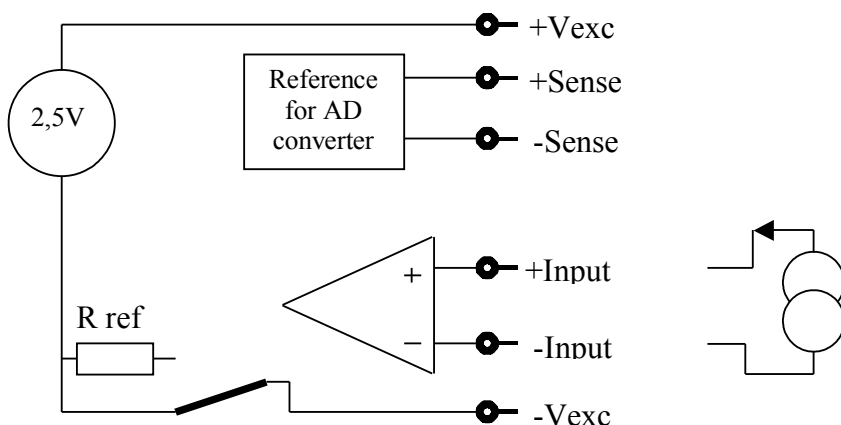


The voltage at the input pins must not exceed $\pm 15V$.

Note for the use of sensors which contain built-in electronics:

These types of sensor usually need a 24 VDC power supply. The Autolog 3000 card can not deliver this supply power, which means an external power supply is required.

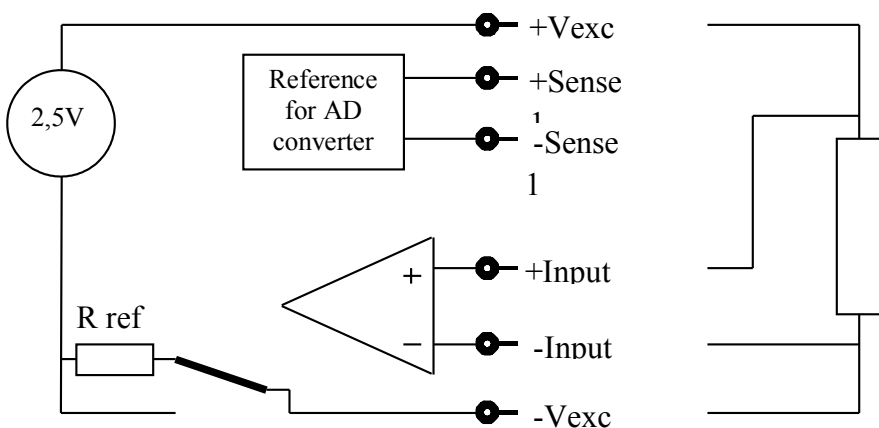
In this case it is important that a connection is made between the analog ground of the measurement card (pin 1) and the 0V of the 24 V external power supply.

5.1.2 Current input connection (CA3460 only)

When the current measurement is selected, a 22Ω resistor is switched between the + and – input terminals on the CA3460 board. The maximum current is 50 mA. When this current is higher, the input resistance will increase to reduce the current and power dissipation in the 22Ω resistor.

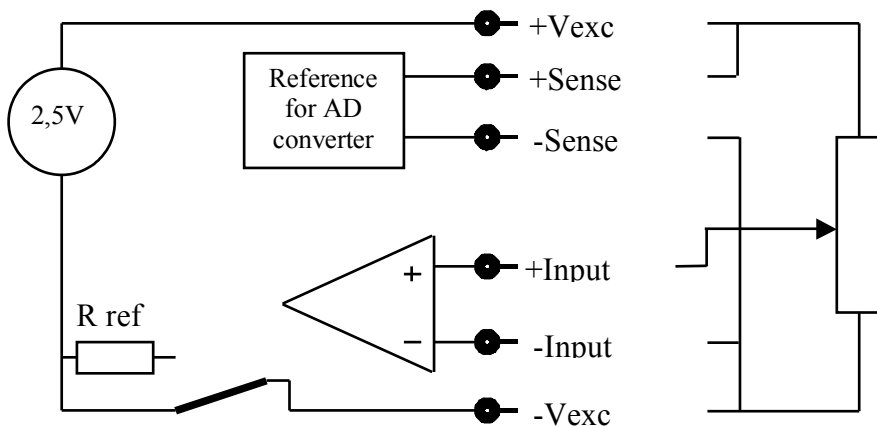
Care must be taken that the maximum voltage on the input terminals does not exceed $\pm 15\text{V}$!

Please note the remark about the use of sensors with built-in electronics above!

5.1.3 PT100/resistor connection

For the PT100 or resistor measurement a ratio metric measurement is done with the onboard reference resistor. The external resistor is connected in series with the internal resistor ($R_{\text{ref}} = 10\text{ k}\Omega$) to the 2.5V supply. The maximum current through the external resistor is 250 μA when the external resistor is 0Ω . This current will be lower when the external resistor is higher.

5.1.4 Potentiometer connection

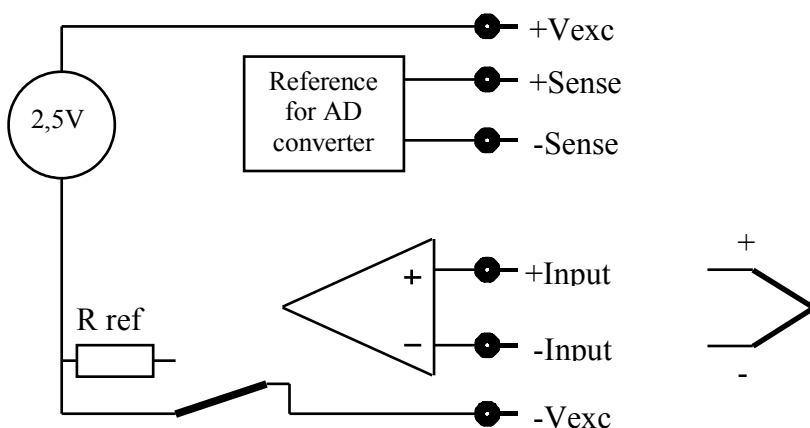


The measurement of potentiometers usually uses 3 wires: +Excitation, -Excitation and centre tap for the signal.

For measurement with the Autolog 3000 the excitation wires should be looped through to the inputs as shown above, to ensure an accurate potentiometer-measurement. The minimum potentiometer resistance value is 60 Ω .

5.1.5 Thermocouple connection

The measurement of a thermocouple is basically the same as the measurement of a voltage signal.



With this measurement only the thermo voltage is measured. The cold junction temperature must be known to the system to generate the real temperature of the thermocouple point. This cold junction temperature must be measured by another channel. This channel can be on-board of this CA3460, but it is also possible that this measurement is done on a channel of another CA3460. In this case the cards must be on the same CAN bus, because the cold junction temperature is distributed over the CAN bus.

Burn Out Detection

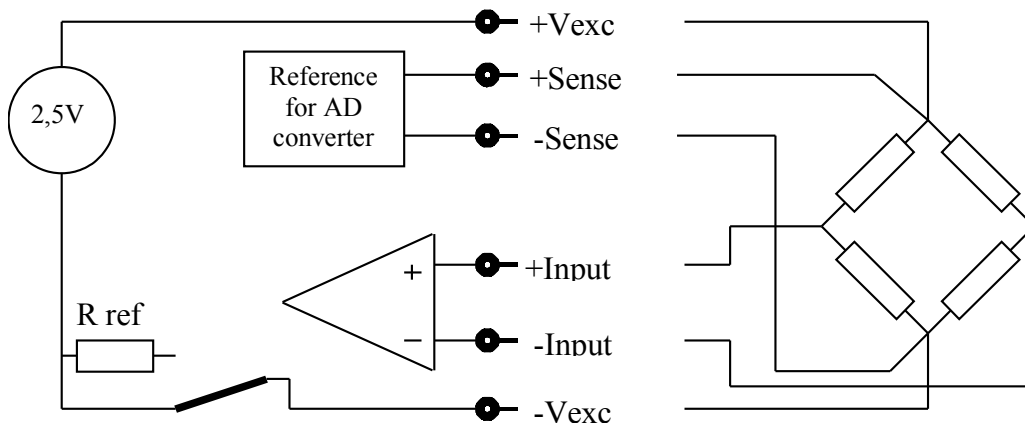
It is possible to set a Burn Out Detection on a thermocouple channel. When this option is selected the + wire is pulled up through a 10 M Ω resistor. When the thermocouple is not connected this wire will be at high level, and the measured temperature will be the maximum value of the selected thermocouple type.

If the Burn Out Detection is not active, a broken thermocouple will result in an open input. Because the measured value of an open input is undefined, any temperature value may be shown. Worst case, the temperature may not be recognisably incorrect.

Note:

However this Burn Out Detection can also influence the measurement when the thermocouple has a high impedance. This will not be the case with normal thermocouples, but there are e.g. non-contacting IR sensors with an internal resistance of about 3 k Ω . With such sensors the burn out detection will form a resistor divider and the measurement will be wrong. To have a correct measurement result, the Burn Out detection must be switched off.

5.1.6 Full bridge connection CA3460 base board

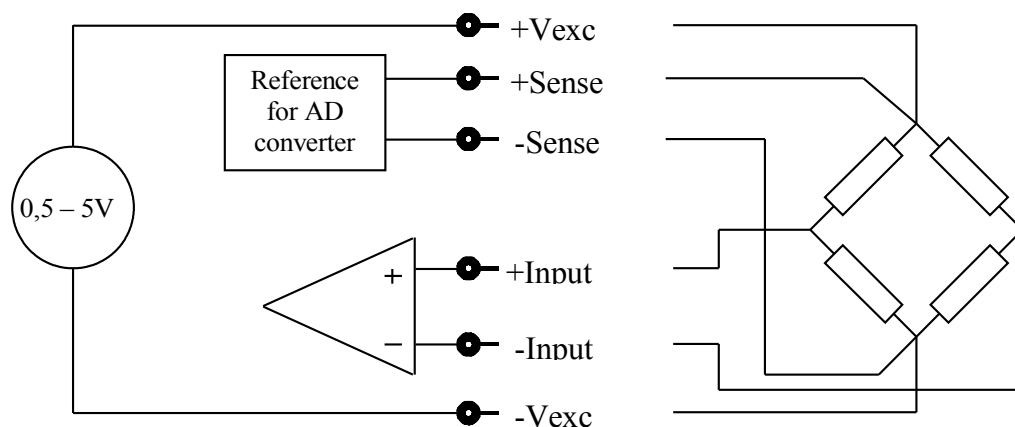


For this measurement on the base board the excitation is fixed on 2,5V. The sense lines must be connected either directly on the connector or through the cable on the bridge.

These sense lines will lead the voltage to the AD converter as a reference. By this way the voltage drop on the excitation lines will be eliminated.

The minimum allowable full bridge resistance (load) is $60\ \Omega$.

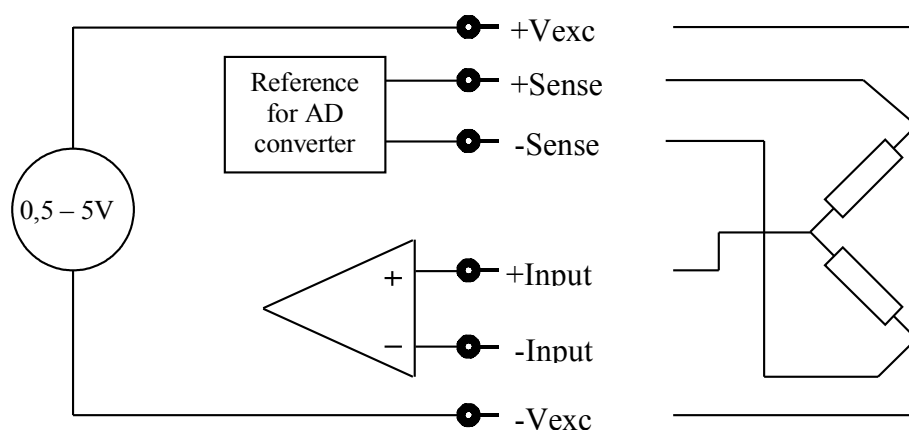
5.1.7 Full-bridge CA3460 option 1 & CM3410



Both the CA3460 with option 1 and the CM3410 multiplexer card have a configurable bridge supply voltage between 0.5 and 5 V in steps of 0.5 V. Note that a maximum current of 50 mA is supplied, which means that e.g. a $< 120\ \Omega$ full bridge can not be measured at the maximum 5V bridge supply voltage. The voltage on the sense lines is used as a reference of the AD converter. In this way a true V/V measurement is done. Because of this measurement principle, the actual value of the excitation voltage is not important. Voltage drops on the excitation wires are not compensated by an increase of the excitation voltage.

When the sense lines are not used, the $-sense$ must be connected to the $-V_{exc}$ and the $+sense$ must be connected to the $+V_{exc}$.

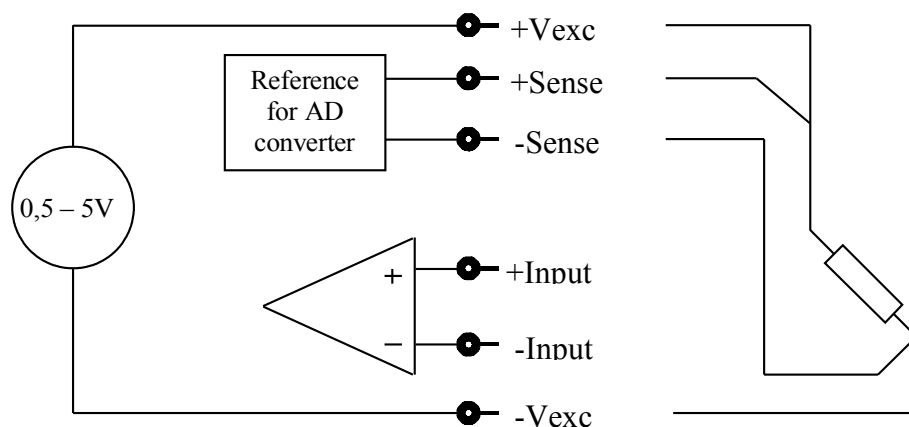
5.1.8 Half-bridge CA3460 option 1 & CM3410



When this measurement is selected an internal half bridge is used to complement the circuit to a full bridge. The internal half bridge is switched between the voltage levels of the sense lines. In this way the internal half bridge is at the same voltage levels as the external half bridge.

The internal half bridge complementation resistors have a resistance of $1000\ \Omega$. The bridge supply voltage can be set between 0.5 and 5 V in steps of 0.5 V. Note that a maximum current of 50 mA is supplied.

5.1.9 Quarter-bridge CA3460 option 1 & CM3410



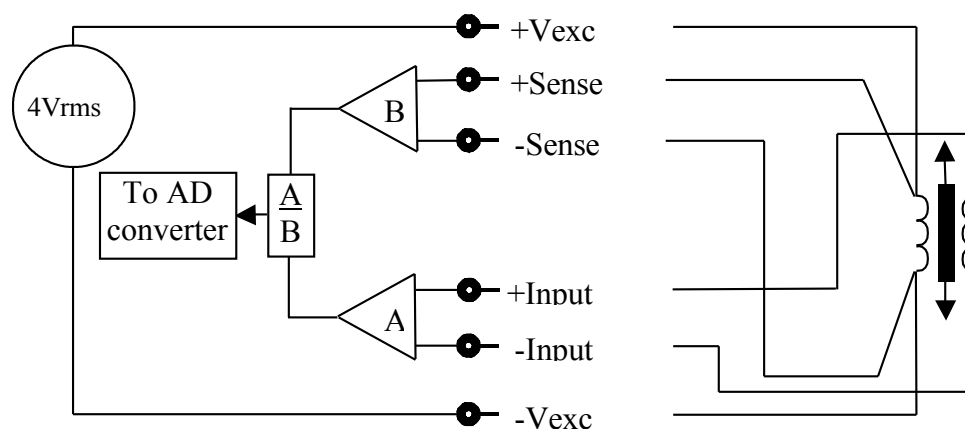
The single external resistor is complemented with 3 internal resistors to get a complete full bridge. Two precision resistors of 1000 Ohms build an internal half bridge, a third internal precision resistor completes the quarter bridge complementation and can be chosen as 120 Ω , 350 Ω or 1000 Ω to match the resistance value of the strain gauge (see manufacturer details). The bridge supply voltage can be set between 0.5 and 5 V in steps of 0.5 V. Note that a maximum current of 50 mA is supplied.

For this measurement the 4 wire principle is used, which will eliminate all the losses in the cabling. This means that the sense wires should be separate from the excitation wires and connected as close to the strain gauge as possible. Bridging the connections at the card instead of at the strain gauge will result in less accurate measurements because cable losses can not be compensated in this case.

Important note:

When using 2-wire connections between strain gauge and measurement device, every meter of this 2-wire connection is directly connected in series with the strain gauge. This has consequences for the sensitivity of the S/G and also means that every change in resistance in the wires, e.g. caused by temperature changes, will be interpreted as strain. The exact influence this has on the accuracy of the measurement depends on the resistance of the cable (cross sectional area times length) and the resistance of the strain gauge.

5.1.10 Full-bridge LVDT CA3460 Option 2



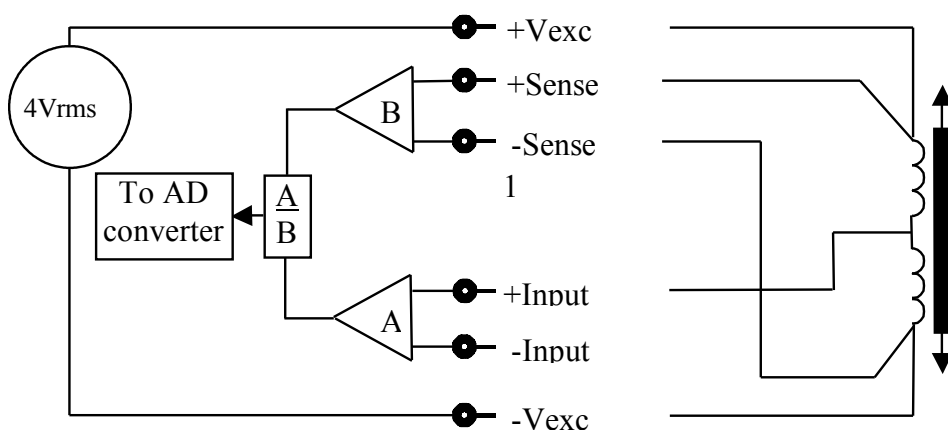
The voltage on the sense lines is used as a reference of the measurement. In this way a true V/V measurement is done. Because of this measurement principle, the actual value of the excitation voltage is not important. Voltage drops on the excitation wires are not compensated by an increase of the excitation voltage.

When the sense lines are not used, the –sense must be connected to the –Vexc and the +sense must be connected to the +Vexc.

Note for option 2:

Whether or not option 2 is used, the base functionality of the card will still be available, and is extended with Carrier Frequency technology.

5.1.11 Half-bridge LVDT CA3460 Option 2



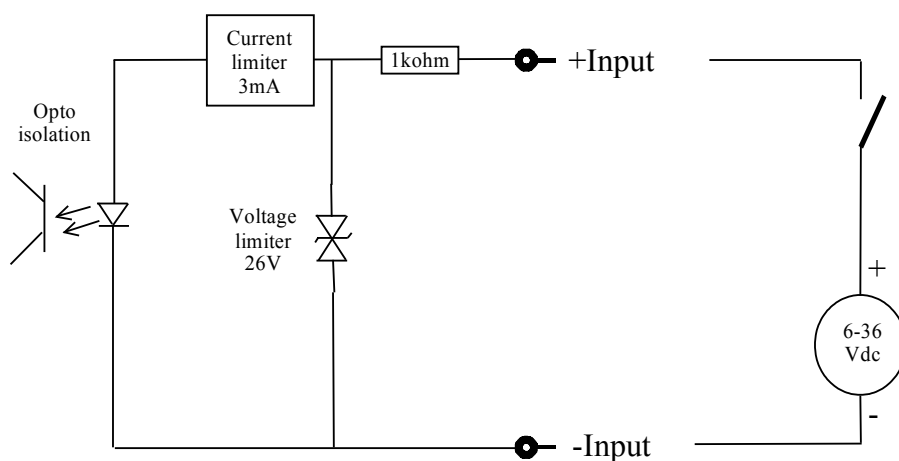
The voltage on the sense lines is used as a reference of the measurement. In this way a true V/V measurement is done. Because of this measurement principle, the actual value of the excitation voltage is not important. Voltage drops on the excitation wires are not compensated by an increase of the excitation voltage.

The –Input is connected to 0V on board.

When the sense lines are not used, the –sense must be connected to the –Vexc and the +sense must be connected to the +Vexc.

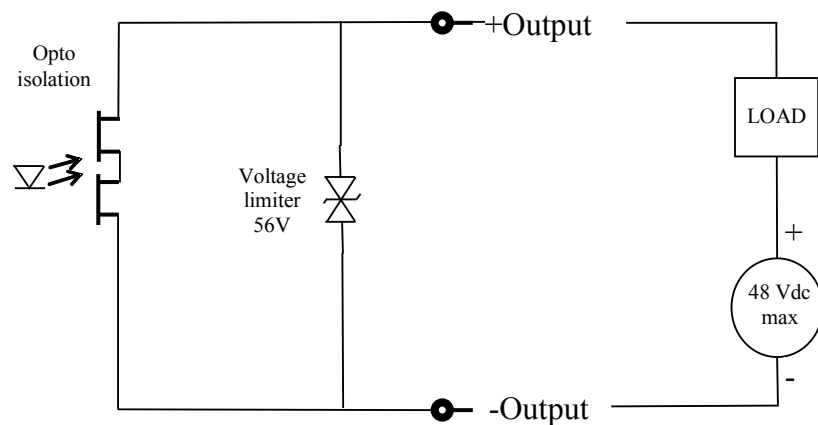
5.2 Signal connection CD3733 board

5.2.1 Digital input connection



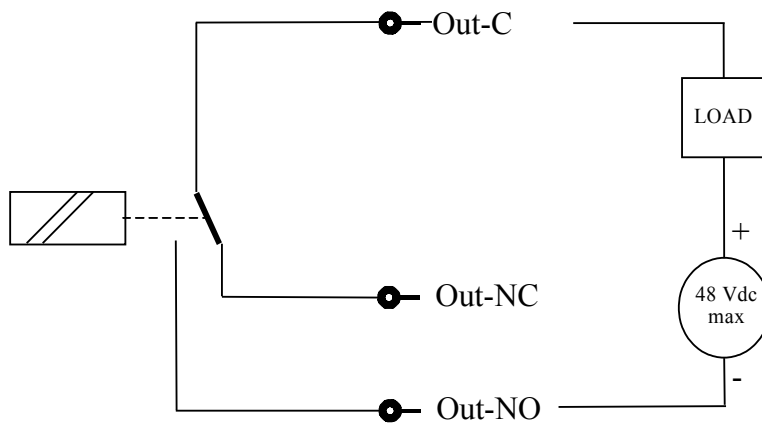
The voltage at the input pins must not exceed 36V.

5.2.2 Solid state output connection



The voltage on the output pins must not exceed 48V.

5.2.3 Relay output connection



The voltage on the output pins must not exceed 48V.

6 Connection diagrams

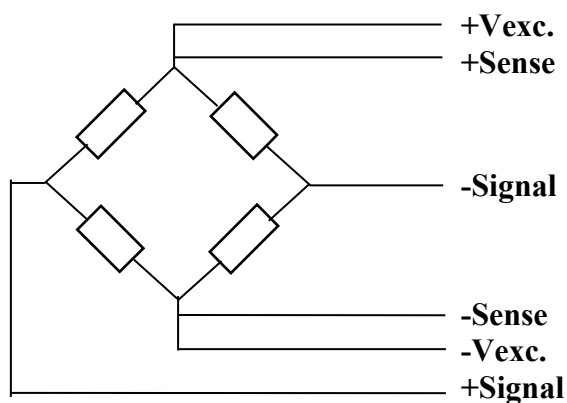
6.1 CA3460 and CM3410 board

The connection diagram for these boards are identical. The connection pins are different. At each diagram en separate table is noted for the connection of the CA3460 card and the CM3410 card.

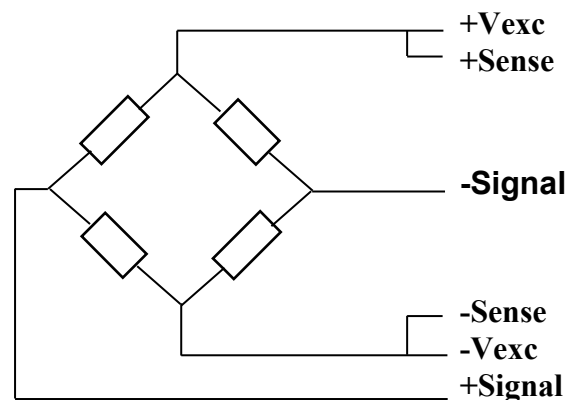
When twisted cable is used for the connection of the sensor the following signals must be used in a wire pair: Vexc+/-, Sense+/-, and Signal +/-

6.1.1 Full bridge

6-wire diagram



4-wire diagram

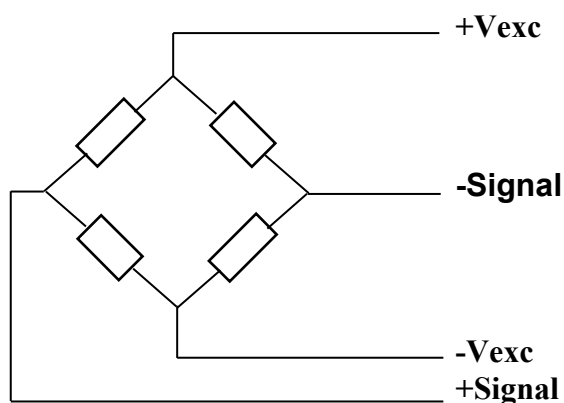


Channel number at CA3460-Card		25 pins DSUB Connector PIN-connection (PIN 1 = Analog GND)					
Conn. 1...3	Conn. 4...6	+Vexc	-Vexc	+Sense	-Sense	+Signal	-Signal
1	4	13	25	12	24	11	23
2	5	9	21	8	20	7	19
3	6	5	17	4	16	3	15

Channel nr at CM3410-Card		37 pins DSUB Connector PIN-connection					
Conn1 Group-Chan.	Conn2 Group-Chan.	+Vexc	-Vexc	+Sense	-Sense	+Signal	-Signal
1-1	2-3	19	37	18	36	17	35
1-2	2-4	16	34	15	33	14	32
1-3	3-1	13	31	12	30	11	29
1-4	3-2	10	28	9	27	8	26
2-1	3-3	7	25	6	24	5	23
2-2	3-4	4	22	3	21	2	20

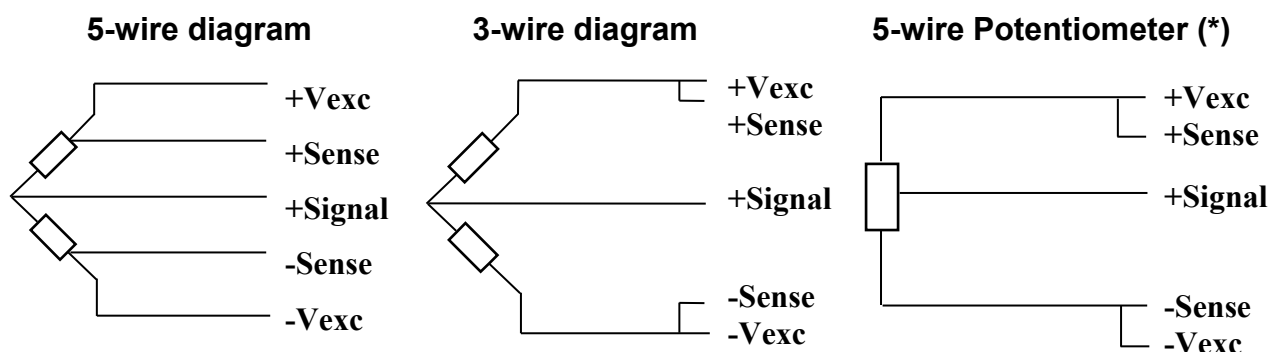
With the CM3410 it is also possible to measure the full bridge in a real 4 wire connection. The measurement principle is the same as a 6 wire connection with links on the connector between the excitation pins and the sense pins. Losses due to cable length and/or connector resistance are not eliminated. The resulting measurement error depends on the cable resistance (cross sectional area times length) and bridge resistance. The only advantage of using 4-wire connections is the ability to connect more channels to each CM3410 card (18 x 4-wire versus 12 x 6-wire).

4 wire connection diagram



Channel nr at CM3410-Card		37 pins DSUB-Connector PIN-connection			
Conn1 Group-Channel	Conn2 Group-Channel	+Vexc	-Vexc	+Signal	-Signal
1-1	2-4	19	37	18	36
1-2	2-5	17	35	16	34
1-3	2-6	15	33	14	32
1-4	3-1	13	31	12	30
1-5	3-2	11	29	10	28
1-6	3-3	9	27	8	26
2-1	3-4	7	25	6	24
2-2	3-5	5	23	4	22
2-3	3-6	3	21	2	20

6.1.2 Half bridge (only CA3460 Option 1 & CM3410)



*) A potentiometer is usually connected using 6 wires (see below), but can also be measured as a “Transducer Half-Bridge” with scaling, in special cases where a 5-wire connection is preferred for external reasons.

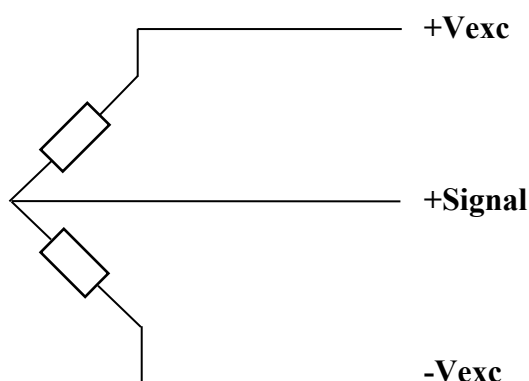
Channel number at CA3460-Card		25 pins DSUB Connector PIN-connection (PIN 1 = GND)				
Conn. 1...3	Conn. 4...6	+Vexc	-Vexc	+Sense	-Sense	+Signal
1	4	13	25	12	24	11
2	5	9	21	8	20	7
3	6	5	17	4	16	3

Channel nr at CM34100-Card		37 pins DSUB Connector PIN-connection				
Conn1 Group-Channel	Conn2 Group-Channel	+Vexc	-Vexc	+Sense	-Sense	+Signal
1-1	2-3	19	37	18	36	17
1-2	2-4	16	34	15	33	14
1-3	3-1	13	31	12	30	11
1-4	3-2	10	28	9	27	8
2-1	3-3	7	25	6	24	5
2-2	3-4	4	22	3	21	2

The “-Signal” is connected to the on board half bridge complementation resistors.

Specific for CM3410: S/G half bridge measurement using 3 wire connection

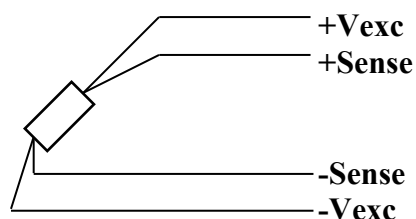
With the **CM3410 multiplexer card** it is also possible to measure the half bridge in a real 3 wire connection without sense lines. The measurement principle is the same as a 5 wire connection with links on the connector between the excitation pins and the sense pins. Losses due to cable length and/or connector resistance are not eliminated. The resulting measurement error depends on the cable resistance (cross sectional area times length) and bridge resistance. The only advantage of using 3-wire connections is the ability to connect more channels to each CM3410 card (18 x 4-wire versus 12 x 6-wire).

3 wire connection diagram

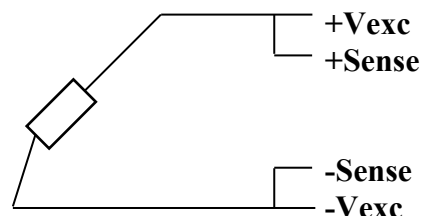
Channel numbers at CM3410-Card		37 pins DSUB Connector PIN-connection		
Conn1 Group-Channel	Conn2 Group-Channel	+Vexc	-Vexc	+Signal
1-1	2-4	19	37	18
1-2	2-5	17	35	16
1-3	2-6	15	33	14
1-4	3-1	13	31	12
1-5	3-2	11	29	10
1-6	3-3	9	27	8
2-1	3-4	7	25	6
2-2	3-5	5	23	4
2-3	3-6	3	21	2

6.1.3 Quarter bridge (only CA3460 Option 1 & CM3410)

4-wire diagram



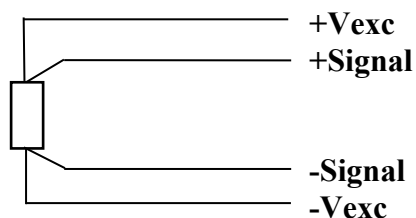
2-wire diagram (not recommended)



Channel nr at CA3460-Card		25 pins DSUB Connector PIN-connection (PIN 1 = GND)					
Conn. 1...3	Conn. 4...6	+Vexc	-Vexc	+Sense	-Sense	+Signal	-Signal
1	4	13	25	12	24	11	23
2	5	9	21	8	20	7	19
3	6	5	17	4	16	3	15

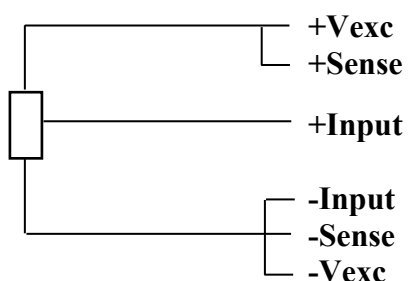
Channel number at CM3410-Card		37 pins DSUB Connector PIN-connection			
Conn1 Group-Channel	Conn2 Group-Channel	+Vexc	-Vexc	+Sense	-Sense
1-1	2-4	19	37	18	36
1-2	2-5	17	35	16	34
1-3	2-6	15	33	14	32
1-4	3-1	13	31	12	30
1-5	3-2	11	29	10	28
1-6	3-3	9	27	8	26
2-1	3-4	7	25	6	24
2-2	3-5	5	23	4	22
2-3	3-6	3	21	2	20

6.1.4 Resistor measurement (Pt100)

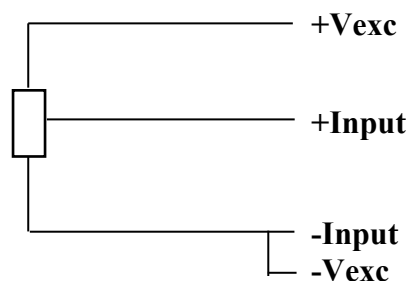


6.1.5 Potentiometer measurement

6-wire diagram (CA3460)



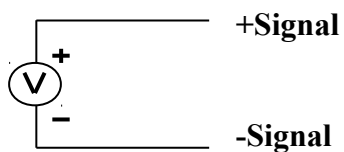
4-wire diagram (CM3410)



Channel nr at CA3460-Card		25 pins DSUB Connector PIN-connection (PIN 1 = GND)					
Conn. 1...3	Conn. 4...6	+Vexc	-Vexc	+Sense	-Sense	+Signal	-Signal
1	4	13	25	12	24	11	23
2	5	9	21	8	20	7	19
3	6	5	17	4	16	3	15

Channel number at CM3410-Card		37 pins DSUB Connector PIN-connection			
Conn1 Group-Channel	Conn2 Group-Channel	+Vexc	-Vexc	+Signal	-Signal
1-1	2-4	19	37	18	36
1-2	2-5	17	35	16	34
1-3	2-6	15	33	14	32
1-4	3-1	13	31	12	30
1-5	3-2	11	29	10	28
1-6	3-3	9	27	8	26
2-1	3-4	7	25	6	24
2-2	3-5	5	23	4	22
2-3	3-6	3	21	2	20

6.1.6 Voltage input

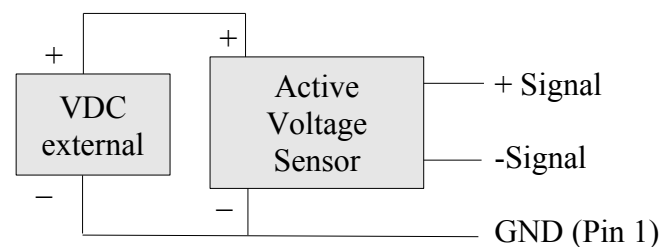
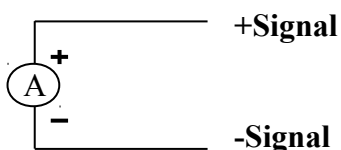


Note for the use of sensors which contain built-in electronics:

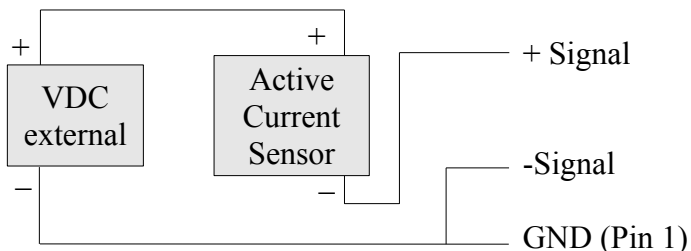
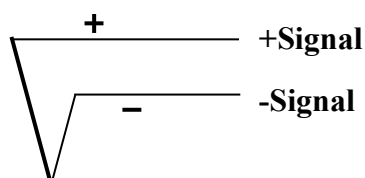
These types of sensor usually need a 24 VDC power supply. The Autolog 3000 card can not deliver this supply power, which means an external power supply is required.

In this case it is important that a connection is made between the analog ground of the measurement card (pin 1) and the 0V of the 24 V external power supply.

6.1.7 Current input (CA3460 only)



6.1.8 Thermocouple



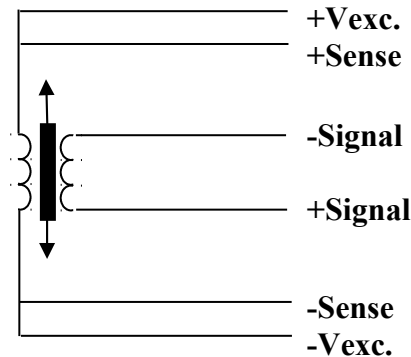
Channel number at CA3460-Card		25 pins DSUB-Connector PIN-connection (PIN 1 = GND)					
Conn. 1...3	Conn. 4...6	+Vexc	-Vexc	+Sense	-Sense	+Signal	-Signal
1	4	13	25	12	24	11	23
2	5	9	21	8	20	7	19
3	6	5	17	4	16	3	15

Channel number CM3410-Card		37 DSUB Connector PIN-connection	
Conn1 Channel	Conn2 Channel	+Signal	-Signal
1-1	2-7	19	37
1-2	2-8	18	36
1-3	2-9	17	35
1-4	2-10	16	34
1-5	2-11	15	33
1-6	2-12	14	32
1-7	3-1	13	31
1-8	3-2	12	30
1-9	3-3	11	29

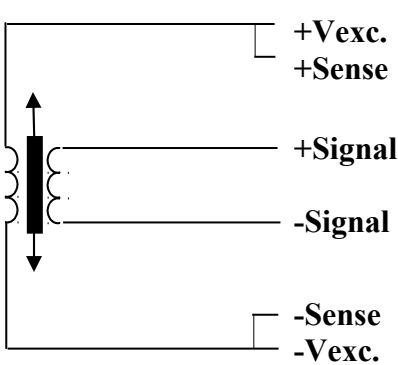
Channel number CM3410-Card		37 DSUB Connector PIN-connection	
Conn1 Channel	Conn2 Channel	+Signal	-Signal
1-10	3-4	10	28
1-11	3-5	9	27
1-12	3-6	8	26
2-1	3-7	7	25
2-2	3-8	6	24
2-3	3-9	5	23
2-4	3-10	4	22
2-5	3-11	3	21
2-6	3-12	2	20

6.1.9 Full bridge LVDT (only CA3460 Option 2)

6-wire diagram

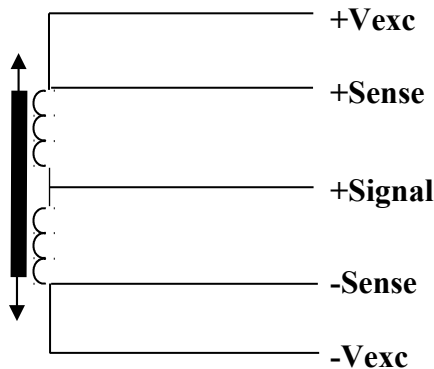


4-wire diagram

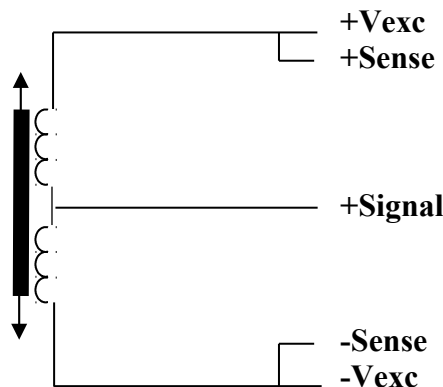


6.1.10 Half bridge LVDT (only CA3460 Option 2)

5- wire diagram



3- wire diagram



Channel number at CA3460-Card		25 pins DSUB Connector PIN-connection (PIN 1 = GND)					
Conn. 1...3	Conn. 4...6	+Vexc	-Vexc	+Sense	-Sense	+Signal	-Signal
1	4	13	25	12	24	11	23
2	5	9	21	8	20	7	19
3	6	5	17	4	16	3	15

6.2 CA3520 board

The strain gauge bridges and LVDT's are connected through 9-pole male DSUB connectors. The pin connections are shown in here:

Pin	Connection	Meaning
1	-EX	-excitation
2	+EX	+excitation
3	+IN	+input
4	-IN	-input
5	Gnd	ground
6	-SE	-sense
7	+SE	+sense
8		not used
9	$\frac{1}{4}$	quarter bridge completion resistor, 120 or 350 ohms

Detailed explanation:

±EX Excitation to the transducers. For the carrier-frequency-amplifier this is an AC-signal of 0,5 to 5 volts at 5000 Hz. Although the polarity-signs do not have a meaning for this AC-signal, they are used here to indicate the relation with +IN and -IN.

±IN Differential input of the amplifier. Like for the excitation, the polarity-signs wouldn't have a meaning if they weren't used to indicate the relation with +EX and -EX. Connecting +EX to +IN and -EX to -IN should give a positive (but overload) output signal.

±SE Sense-lines for 6-wire connection of full-bridges. The + SE and - SE connections have to be connected (see diagrams at the next pages) in order to compensate for the voltage drop of the EXcitation voltage over the lines, connected to the measuring sensors.

$\frac{1}{4}$ Quarter bridge completion resistor. (120Ω or 350Ω precision resistor). A single external strain gauge can be completed by the internal resistors in the other bridge arms, available through $\frac{1}{4}$ -pin. The $\frac{1}{4}$ -bridge completion resistor is internally connected to +EX. With the settings a choice can be made between a 120Ω or a 350Ω internal compensation resistor.

Gnd Ground. This pin is connected to the system ground. Normally this pin is not used.

Screen When a cable with screen is used, this screen must be connected to the housing of the connector. For the optimal screening this housing must be metalised.

6.2.1 Full bridge

The drawings below show the connection of a full strain gauge bridge. This is the most reliable configuration. The leadwire-resistances affect only the sensitivity of the bridge. For instance 6Ω resistances in both the +EX as well as the -EX wire, connected to a 120Ω bridge, give a decrease in output signal of 9.1%. This can be compensated by using the internal sense circuit. However, that does not compensate the temperature influence on the lead wire resistance. A temperature coefficient of $0.4\%/^{\circ}\text{C}$ on 12Ω of copperwire, connected to a 120Ω bridge, will still give $0.04\%/^{\circ}\text{C}$ change in sensitivity. Short, thick cabling is therefore recommended.

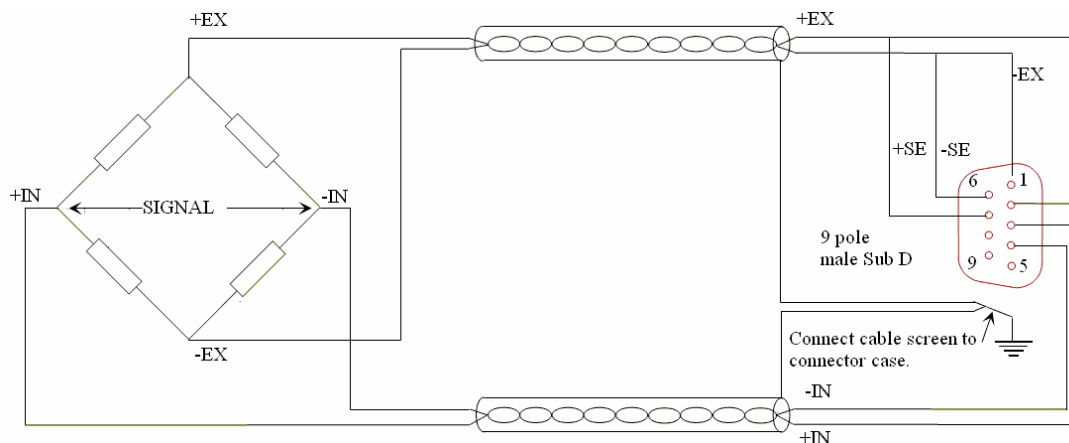


Image: Full bridge, 4-wire strain gauge connection.

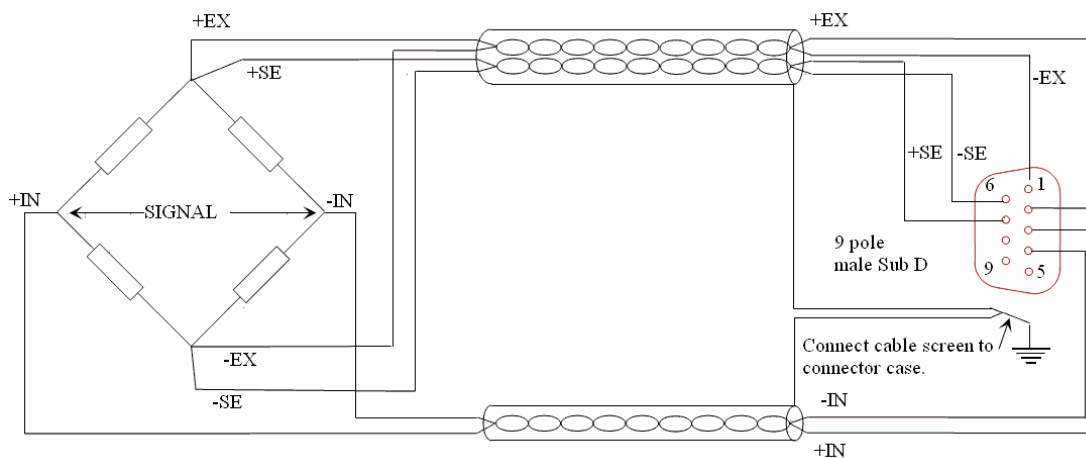


Image: Full bridge, 6-wire strain gauge connection.

6.2.2 Half bridge

The drawings below show half bridge configured strain gauges. The $\frac{1}{2}$ -bridge completion resistors are internally connected to -IN.

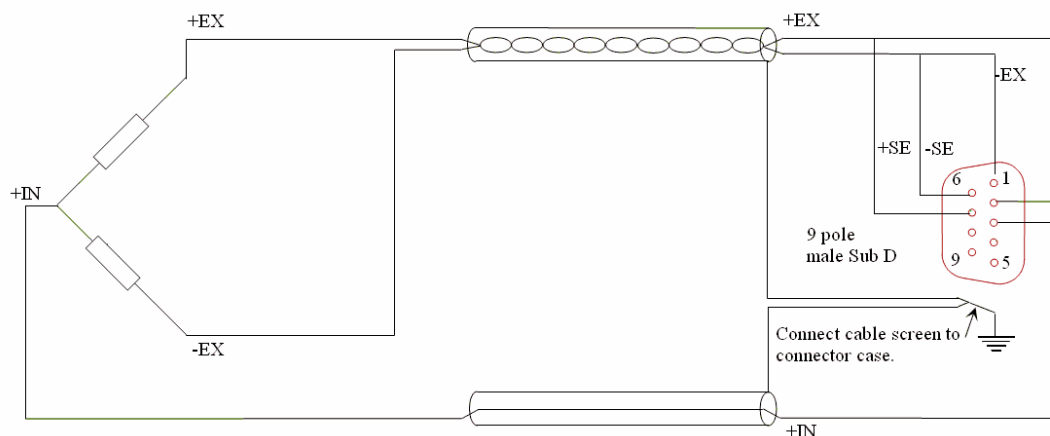


Image: Half bridge, **3-wire** strain gauge connection.

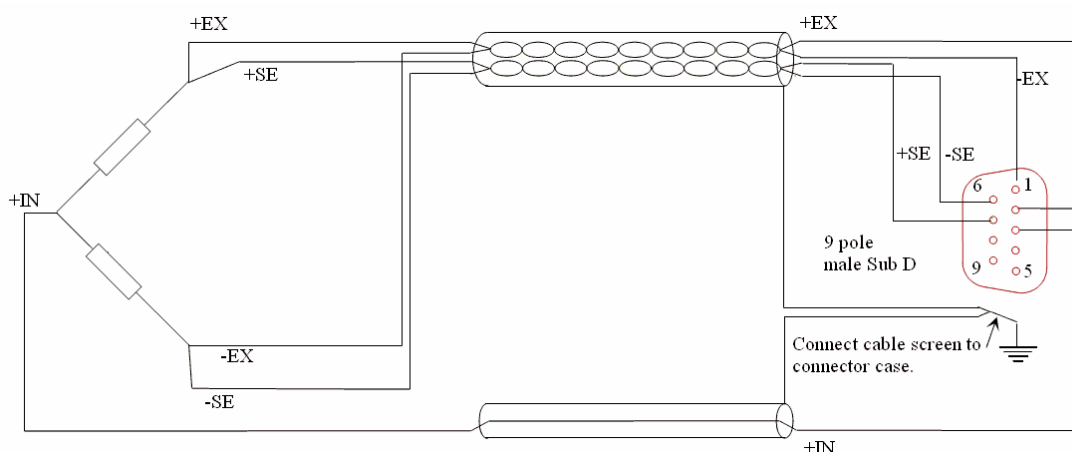


Image: Half bridge, **5-wire** strain gauge connection.

The connection of the $\frac{1}{2}$ -bridge completion to -IN sets the amplifier for positive gain: so connecting the +IN signal to +EX gives a positive output signal (although in overload). Half bridge connections are more critical than full bridge. The lead wire resistances in the $\pm$ EX-lines are in series with the 2 strain gauges, in the Wheatstone bridge. Any slight unbalance in these lead wire resistances will give rise to signal offset. Every $1\text{ m}\Omega$ difference in resistance on a 120Ω bridge gives $2\text{ }\mu\text{V/V}$ offset. This may be compensated by use of the internal balance circuit. However, temperature-influence can not be compensated. Short, thick cabling is highly recommended.

6.2.3 Quarter bridge using 2 wires

Application of quarter bridges is the simplest but least accurate way of measuring. The lead wires in 2-wire configurations are completely incorporated in one arm of the strain gauge bridge. Every $1\text{ m}\Omega$ of cabling resistance in series with a 120Ω strain gauge, will directly add $2\text{ }\mu\text{V/V}$ signal offset, though in practical situations it is more likely to have several extra ohms of resistance due to cabling.

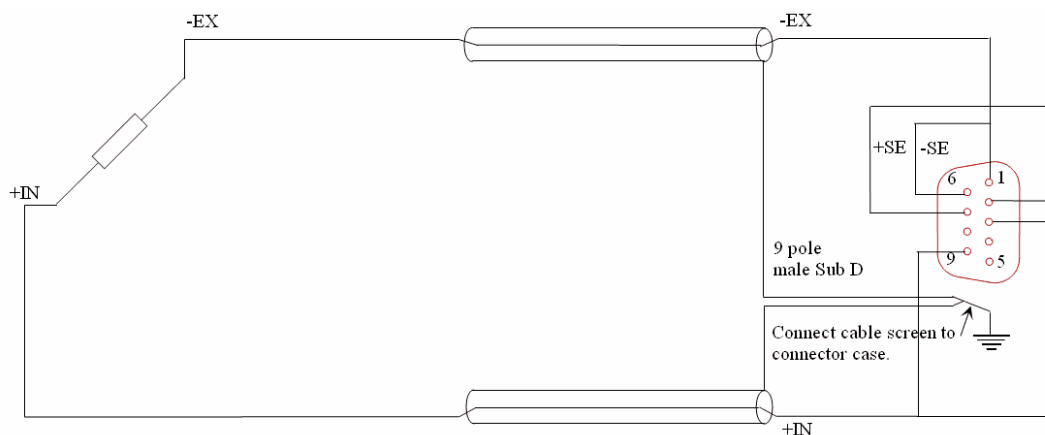


Image: Quarter bridge, **2-wire** strain gauge connection.

The internal balance-compensation range is 65 mV/V at 5 volt excitation. This allows for 1.25Ω total leadwire resistance in series with a 120Ω strain gauge. A bridge voltage of 0.5 volts however gives a 10 times balance range and enables 12.5Ω lead wire in series with a 120Ω strain gauge. The temperature influence on the cable resistance can not be compensated. The temperature coefficient of copper of 0.4%/°C will give rise to 8.3 μV/V offset change for each Ω in series with a 120Ω strain gauge. Short and thick cabling is evidently necessary!

6.2.4 Quarter bridge using 3 wires

Most of the problems, mentioned before, can be avoided by using the 3-wire connection method. It adds the resistance of the -EX-leadwire to the external strain gauge, and it adds the resistance of the wire leading to the internal 1/4-bridge completion to this internal 1/4-bridge resistance. Only the difference in lead wire resistance (and connector contact resistance) gives signal offset.

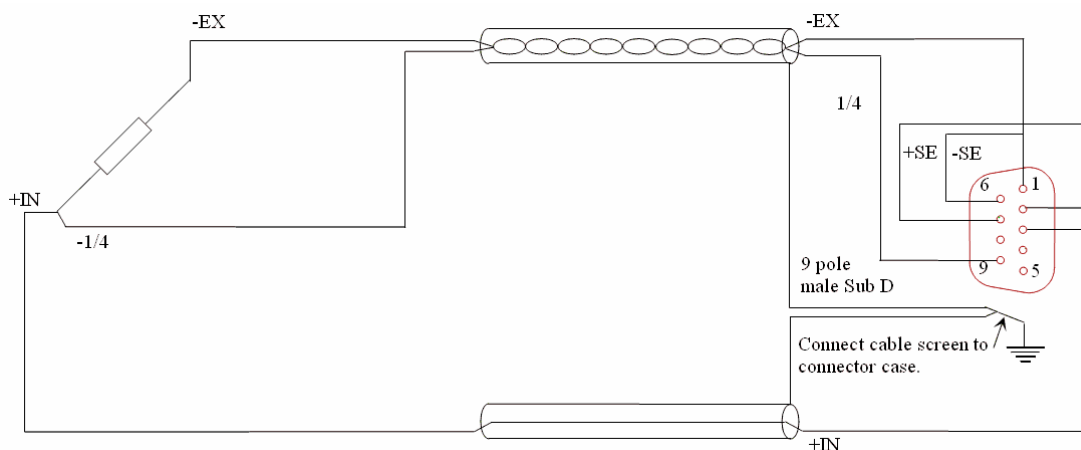


Image: Quarter bridge, **3-wire** strain gauge connection.

A similar situation as with the 1/2-bridge connection method has appeared. Every 1 mΩ of difference in resistance, when using 120Ω strain gauges, gives a change in signal offset of 2 μV/V. This may be compensated internally by the balance circuit. However, the temperature-influence cannot be compensated for. Short and thick cabling is again highly recommended.

6.2.5 Displacement transducers

LVDT's, or *Linear-Variable-Differential Transformers* may be configured as full or half bridges. The connection methods for both possibilities are shown in the following drawings.

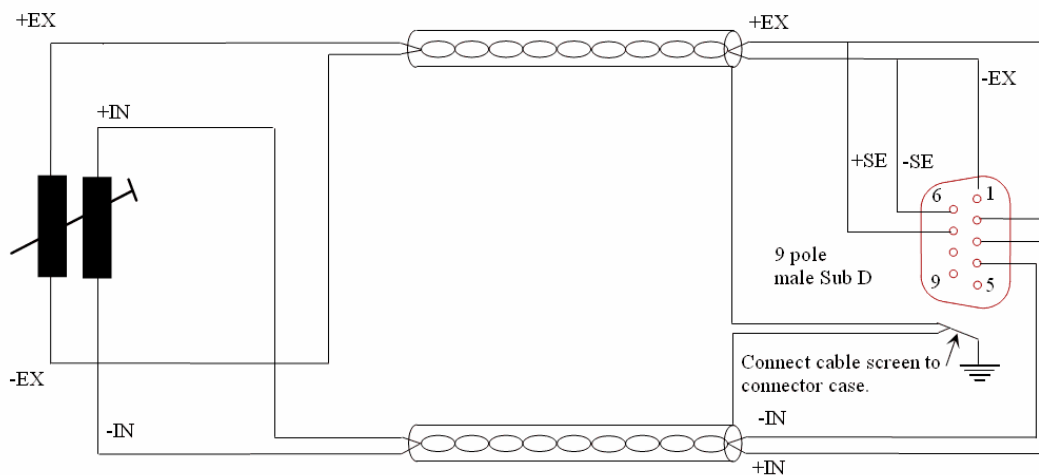


Image: Connection of a full bridge LVDT.

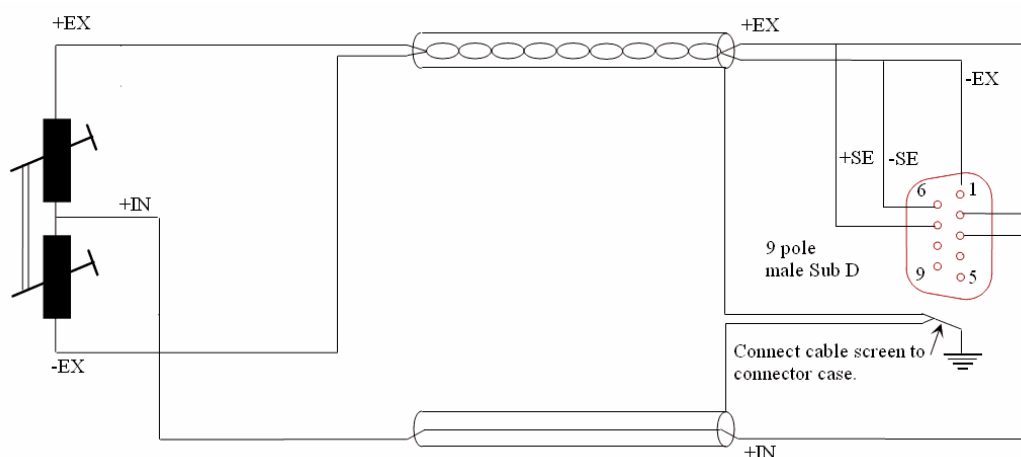
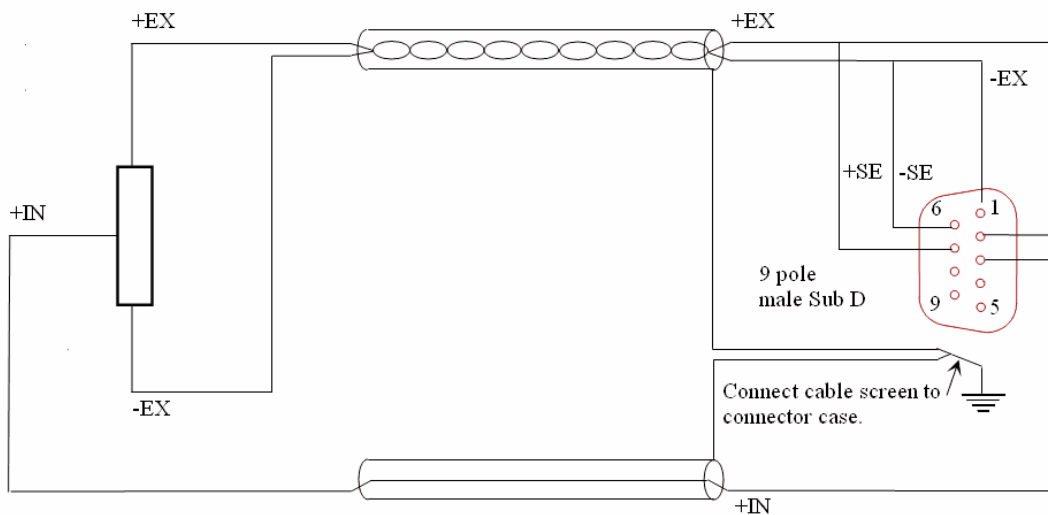


Image: Connection of a half bridge LVDT.

6.2.6 Potentiometer

A potentiometer can be connected as a half bridge, 3 wire connection:



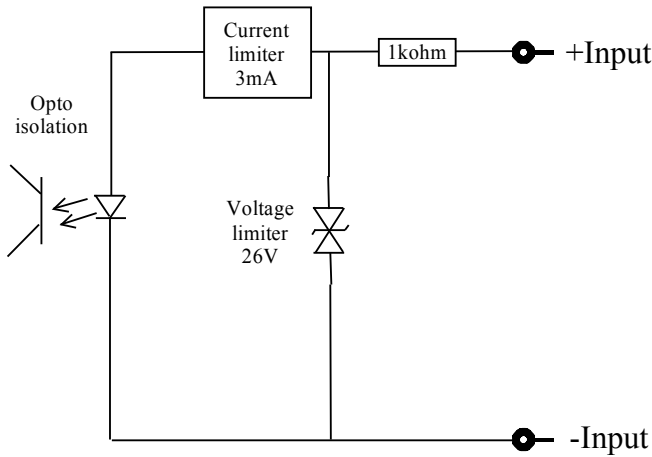
When measuring a Potentiometer based sensor, the mid position of the potentiometer will be the zero point. Moving the potentiometer to the minimum or maximum position, the output value will be in the range of –full range to +full range (-100% to +100%).

Based on the actual input resistance of the CA3520 of about 50K, the following non-linearity will be present when measuring a potentiometer with a higher value:

Potmeter value	Non-linearity
500 Ω	0.15 %
1000 Ω	0.3 %
5000 Ω	1.45 %

6.3 CD3733 board

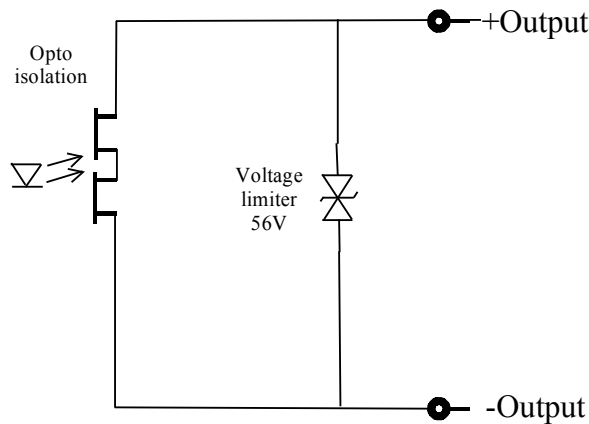
6.3.1 Digital Inputs



Pins on connector CONN1

Channel nr. at CD3733-Card	37 DSUB Connector PIN-connection		Channel nr. CD3733-Card	37 DSUB Connector PIN-connection	
Channel	+Input	- Input	Channel	+ Input	- Input I
1	19	37	9	11	29
2	18	36	10	10	28
3	17	35	11	9	27
4	16	34	12	8	26
5	15	33	13	7	25
6	14	32	14	6	24
7	13	31	15	5	23
8	12	30	16	4	22

6.3.2 Solid State outputs

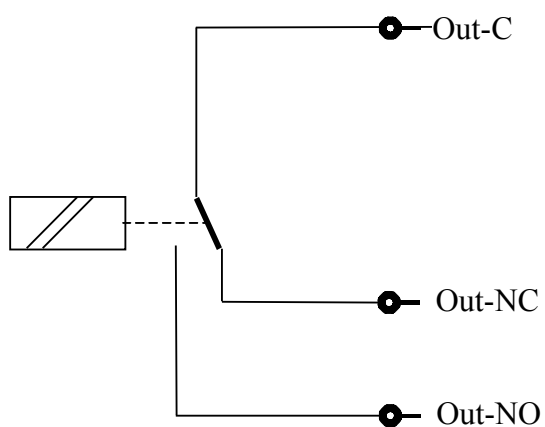


Pins on connector CONN2

Channel nr at CD3733-Card	37 DSUB Connector PIN-connection	
Channel	+Output	-Output
1	1	20
2	2	21
3	3	22
4	4	23
5	5	24
6	6	25
7	7	26
8	8	27

Channel nr. CD3733-Card	37 DSUB Connector PIN-connection	
Channel	+Output	-Output
9	9	28
10	10	29
11	11	30
12	12	31

6.3.3 Relay contact outputs



Pins on connector CONN2

Channel nr. at CD3733-Card	37 DSUB Connector PIN-connection
Channel	pin
1-NC	13
1-NO	32
1-C	14
2-NC	33
2-NO	15
2-C	34

7 Connection utilities

7.1 Terminal block PP25DST

For the CA3460 card a special terminal connection block is available.

With the use of this terminal block, wires can easily be connected to the D25 connector, with the use of screw terminals.



Signal connections:

Terminal block	D25 connector	signal	signal	D25 connector	Terminal block
13	13	1-Vexc+	1-Vexc-	25	25
12	12	1-Sense +	1-Sense-	24	24
11	11	1-IN+	1-IN-	23	23
10	10	1-SI+	1-SI-	22	
					22
9	9	2-Vexc+	2-Vexc-	21	21
8	8	2-Sense +	2-Sense-	20	20
7	7	2-IN+	2-IN-	19	19
6	6	2-SI+	2-SI-	18	
					18
5	5	3-Vexc+	3-Vexc-	17	17
4	4	3-Sense +	3-Sense-	16	16
3	3	3-IN+	3-IN-	15	15
2	2	3-SI+	3-SI-	14	14
1	1	Ground	Housing		26

Vexc: Excitation supply.

Sense: Differential sense lines, for measurement of the excitation voltage on the sensor.

IN: Voltage or Current measurement lines. Between these lines the actual measurement is performed

SI: Sensor Identification lines. With these lines the sensor electronic datasheet can be read.

If this Terminal block is used on the second D25 connector of the CA3460, then the channel numbering is 4, 5 and 6 instead of 1, 2 and 3.

Pin 26 of the terminal block is connected to the housing of the system. This pin can be used to connect the screen of the connection cable.

The terminal blocks must be ordered separately.

7.2 Terminal block PP37DST

For the CM3410 card a special terminal connection block is available.

With the use of this terminal block, wires can easily be connected to the D37 connector, with the use of screw terminals.



Pin numbering of the PP37DST is the same as on the 37DSUB connector on the board.

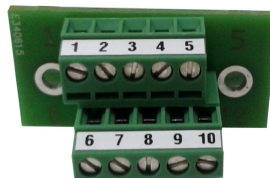
Pin 38 of the terminal block is connected to the housing of the system. This pin can be used to connect the screen of the connection cable.

The terminal blocks must be ordered separately.

7.3 Terminal block PP9DST

For the CA3520 card a special terminal connection block is available.

With the use of this terminal block, wires can easily be connected to the DSUB9 connector, with the use of screw terminals.

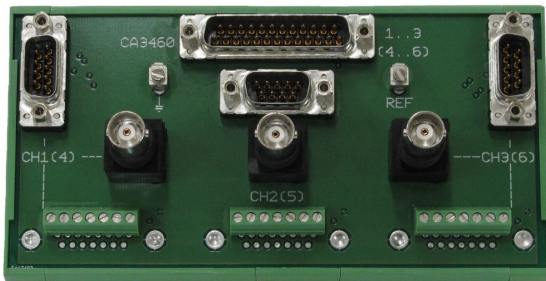


Pin numbering of the PP9DST is the same as on the DSUB9 connectors on the board (see also chapter 6.2).

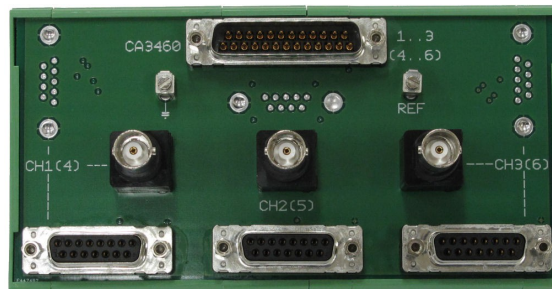
The terminal blocks must be ordered separately.

7.4 Connector PP-25-AP3

The PP-25-AP3 connector can be used for a simple connection to sensors with either a SubD9 connector (PP-25-AP3-9S) or a SubD15 connector (PP-25-AP3-15B).



PP-25-AP3-9S

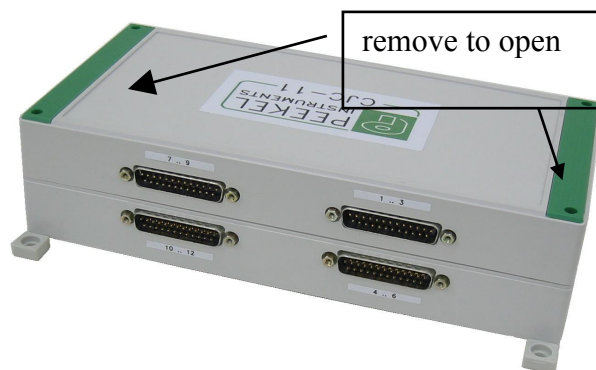


PP-25-AP3-15B

SubD25 male on CA3460	SubD9 – female on PP-25AP3-9S	SubD9 – male on PP-25AP3-15B	Signal name
Channel 1			
25	1	5	Excitation -
13	2	6	Excitation +
11	3	8	Input +
23	4	15	Input -
24	6	12	Sense-
12	7	13	Sense+
Channel 2			
21	1	5	Excitation -
9	2	6	Excitation +
7	3	8	Input +
19	4	15	Input -
20	6	12	Sense-
8	7	13	Sense+
Channel 3			
17	1	5	Excitation -
5	2	6	Excitation +
3	3	8	Input +
15	4	15	Input -
16	6	12	Sense-
4	7	13	Sense+

7.5 CJC-11 connection box

When measuring thermocouples the cold junction temperature must be accurately measured as well. The cold junction temperature is the temperature at the connection terminals, where the transition from copper to the thermocouple wire material causes further thermoelectric voltages which must be compensated through firmware-calculations (CJC – Cold Junction Compensation). For this purpose Peekel Instruments developed the CJC-11 connection box.

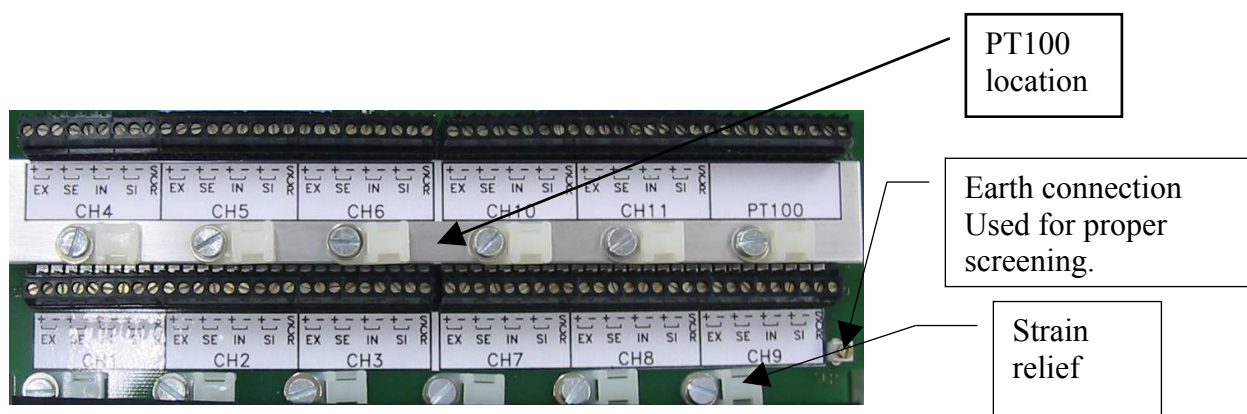


What makes this connection box special is the massive aluminum block, placed between two rows of screw terminals. Additional measures ensure that there is a good thermal conduction between aluminum block and screw terminals. The size of the block helps to reduce the speed at which external temperature influences cause the temperature of the cold junction to change.

For accurate measurement of the temperature of the screw terminals a class A Pt-100 sensor is mounted in the middle of the aluminum block. This sensor is connected internally on CH12.

The thermocouple wires are led into the box through a gap in the side of the housing. To protect the inside of the box from air circulation the gap is closed off using a neoprene foam band.

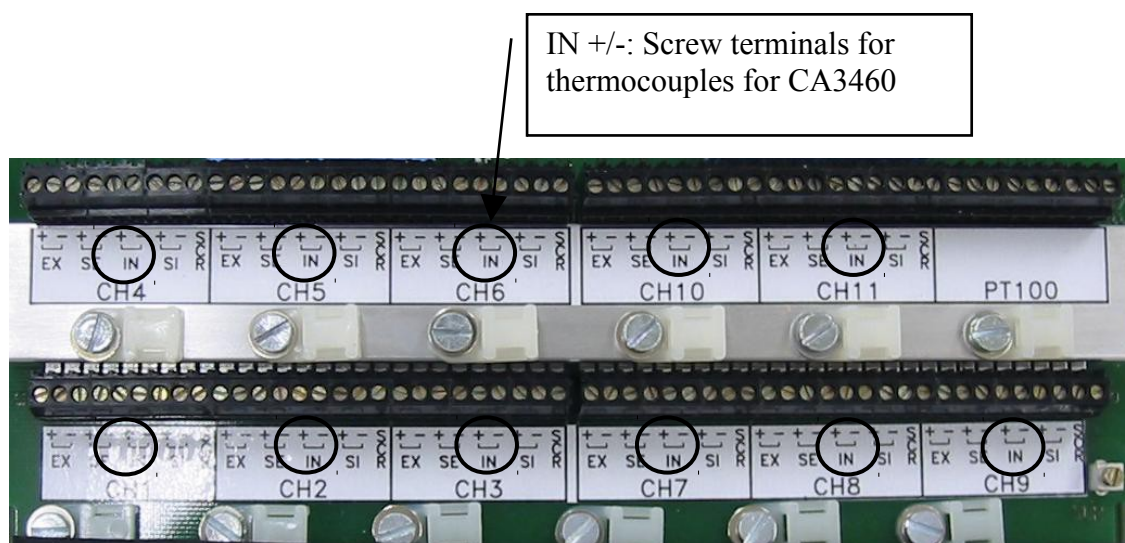
On the other side of the housing are four 25-pin D-Sub connectors. Using appropriate connection cables the CJC-11 can be connected either to two CA3460 measurement cards (for a total of 11 thermocouples and 1 CJC) or to a single multiplexer card CM3410 (for a total of 34 thermocouples and 1 CJC).



7.5.1 CJC-11 in combination with CA3460

4 standard cables are delivered with the CJC11 box, for the connection to two CA3460 cards. Using this configuration, a total of 11 thermocouples can be measured, with 1 CJC.

The connection to the thermocouples uses the screw terminals labeled IN+ and IN-. It is important to note which thermocouple wire is '+' and which is '-'. For CA3460 with thermocouples, the other screw terminals are not relevant.



7.5.2 CJC-11 in combination with CM3410

The CJC-11 has four 25-pin D-Sub connectors. The connection cables delivered with the box can be used to connect these with the two connectors on the CM3410 measurement card (please note the labels on the connectors). With this setup, a total of 34 thermocouples can be measured, using a single CJC.

When using a CM3410 (unlike the CA3460 above), all screw terminals in the CJC-11 box are used. The tables below show which screw terminal are assigned to which channel numbers on the card.

1. Connection cable between CJC D-Sub 1..3 + D-Sub 7..9 and CONN1 (CM3410)

CM3410 group/ch	CJC11 ID	37-DSUB CONN1	25 DSUB 1-3	25 DSUB 7-9	CM3410 group/ch	CJC11 ID	37-DSUB CONN1	25 DSUB 1-3	25 DSUB 7-9
1-1	CH2-EX	19	9		1-10	CH7-SE	10		12
		37	21				28		24
1-2	CH2-SE	18	8		1-11	CH7-IN	9		11
		36	20				27		23
1-3	CH2-IN	17	7		1-12	CH7-SI	8		10
		35	19				26		22
1-4	CH2-SI	16	6		2-1	CH8-EX	7		9
		34	18				25		21
1-5	CH3-EX	15	5		2-2	CH8-SE	6		8
		33	17				24		20
1-6	CH3-SE	14	4		2-3	CH8-IN	5		7
		31	16				23		19
1-7	CH3-IN	13	3		2-4	CH8-SI	4		6
		32	15				22		18
1-8	CH3-SI	12	2		2-5	CH9-EX	3		5
		30	14				21		17
1-9	CH7-EX	11		13	2-6	CH9-IN	2		3
		29		25			20		15

1. Connection cable between CJC D-Sub 4..6 + D-Sub 10..12 and CONN2 (CM3410)

CM3410 group/ch	CJC11 ID	37-DSUB CONN2	25 DSUB 4-6	25 DSUB 10-12	CM3410 group/ch	CJC11 ID	37-DSUB CONN2	25 DSUB 4-6	25 DSUB 10-12
2-7	CH5-EX	19 37	9 21		3-4	CH10-SE	10 28		12 24
2-8	CH5-SE	18 36	8 20		3-5	CH10-IN	9 27		11 23
2-9	CH5-IN	17 35	7 19		3-6	CH10-SI	8 26		10 22
2-10	CH5-SI	16 34	6 18		3-7	CH11-EX	7 25		9 21
2-11	CH6-EX	15 33	5 17		3-8	CH11-SE	6 24		8 20
2-12	CH6-SE	14 31	4 16		3-9	CH11-IN	5 23		7 19
3-1	CH6-IN	13 32	3 15		3-10	CH11-SI	4 22		6 18
3-2	CH6-SI	12 30	2 14		3-11	PT100	3 21		5 17
3-3	CH10-EX	11 29		13 25			2 20		3 15

8 Active X controls

8.1 CA3460 Active X Control

Using the CA3460Net control you can configure and control a collection of CA3460 cards connected to a communication interface. The network and its devices can be configured using the following three property pages:

- Network Configuration: Configure communication interface and scan for available cards.
- Cards Configuration: Configure the individual channels of each card to set the type of measurement and measurement interval.
- Channels Configuration: Configure the individual channels of each card to set the type of measurement and measurement interval.
- Trips Configuration: Configure up to four trips for each individual channel of each card.

8.1.1 CA3460 properties

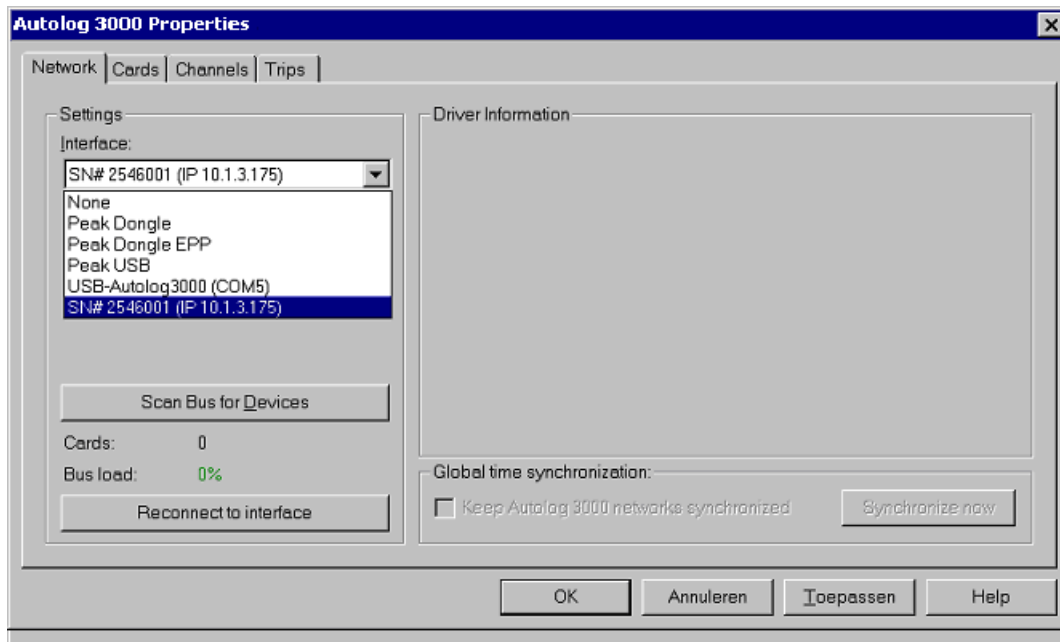
The settings for CA3460 modules can be shown and modified using a series of property pages, which are described below.

8.1.2 Network Configuration Page

Use this dialog to configure the communication network. Select the communication interface and parameters and set the correct speed, then press 'Scan Bus for Devices' to detect which devices are connected to the communication bus.

After detecting the devices, proceed to the Channels Configuration Page to configure the individual channels.

The first page will show the interfaces which are available to communicate with one or more Autolog 3000 systems. If more than 1 system must be connected to the controlling software (Autosoft, Signasoft or an other package), for each of them the next actions must be preformed.



First select the interface on which the device is connected that you want to add to the software configuration.

The interface which are selectable are:

3. none.
No interface selected
4. Peak Dongle
This is a dongle placed on the printer port, for communicating with the CAN bus
5. Peak Dongle EPP
Same as previous , only now the EPP facilities are used on the printer port
6. USB-Autolog 3000 (COM5)
This is a direct USB connection to a Autolog system. If more Autolog 3000 systems are connected to the PC with several USB ports, for each of those systems a separate interface will be in this list. The comm port number in those interface names will be different. This port number is assigned to the Autolog 3000 system during installation.
7. SN #2546001 (IP 10.1.3.175)
This is a direct connection through the Ethernet network. The serial number in the interface name belongs to the PB3000 in the Autolog 3000 system.
If more Autolog 3000 systems are connected to the network, for each of those systems a separate interface will be in this list.

When an interface is selected, extra settings can be made for this specific interface.

Speed (kbps): Select the communication speed to use on the CAN bus network. When this speed is changed it can take some seconds before the Autolog 3000 systems has adapted to this speed. If the selected speed is to fast, no connected can be made to the Autolog 3000 systems, because due to the errors on the bus, the data from the Autolog 3000 systems will not be received by the PC. The maximum speed of the CAN network depends on the total cable length.

CAN Busconfiguration		Max. number of channels at several measurement speeds			
Speed	Total cablelength	1000 Hz	100 Hz	10 Hz	1 Hz
1 Mbit /s	<30 m	7	70	192	192
800 kbit/s	<50 m	5	56	192	192
500 kbit /s	<100 m	3	35	192	192
250 kbit /s	<250 m	2	17	175	192
125 kbit /s	<500 m	1	8	87	192
50 kbit /s	<1000 m	-	3	35	192
20 kbit /s	<2500 m	-	1	14	140

Can bus speed versus Cable length.

The actual maximum cable length at a specific CAN bus speed may be shorter then mentioned in this table due to cable capacity and used stub lines or other connection hardware. Be very careful if the length mentioned in this table must be used.

This speed must also be entered when the “**PEAK USB**” interface is selected.

When a interface is selected and the requested parameters are entered, a “**Scan Bus for Devices**” command must be given. Now the interface will be checked for the systems connected to this interface. If the interface is usable by the software the “**Driver Information:**” box will show the driver specific information from the communication interface hardware driver.

Just behind the text “**Cards:**” the number of cards found in the Autolog 3000 system will be displayed.

If for some reason no connection can be made to the interface the “**Reconnect to interface:**” command can be given. The connection to interface will be closed and established again.

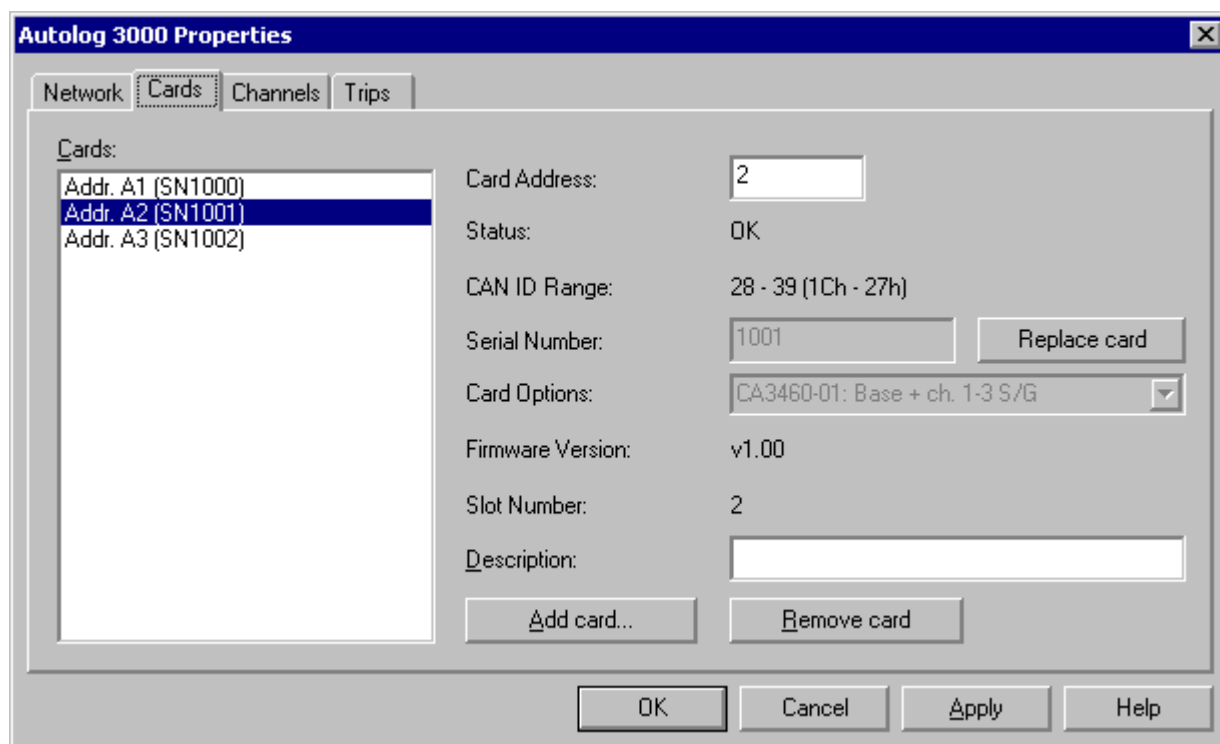
The “**Bus load:**” shows the amount of communication as a percentage of the available bandwidth on the communication interface between PC and device. This is just an indication. It is not an accurate number

Global time synchronization

This item is selectable when more then 1 Autolog 3000 system is connected to the PC. When selected the software will try to synchronize the incoming data. For this reason the “**Synchronize now**” command must be given once. After this command the time stamps belonging to the data will be identical for the separate Autolog systems. Important is that the cable connection for the synchronization is present. If not all the Autolog 3000 system will run on there local clock. Because these clock are derived from the CPU clock they will not be exactly the same. With the external synchronization cable connected all the systems will run on the same clock generated by one of the connected systems.

The second problem with time synchronization is the deviance between the Autolog 3000 clock(s) and the PC date/time. These two will also be unequal. The software will try to adapt the time stamp belonging to the measured values to be synchronized with the PC date/time clock. To have an absolute reference to time, be sure that the PC clock is running correct. (this can be established by using the DCF77 date/time signal).

8.1.3 Cards Configuration Page



Use this dialog to configure the individual cards. You can select the card to configure from the list on the left side. If this list does not show any cards, go to the Network Configuration Page to configure the communication network and press the 'Scan Bus for Devices' button.

The configuration items on the right side of the dialog show the settings for the currently selected card.

The individual items in this configuration page described:

Cards: Select a card from this list to show its information.

Card Address: Shows the logical card address of the card. This address determines the CAN ID range that the card uses for communication. If you change this value, the card will be reprogrammed to communicate using the new address.

Status: Shows the communication status of the card. The status is OK if all channels on the card respond as expected, DISCONNECTED if the card fails to produce measurement values for one or more channels on the card.

CAN ID Range: Shows the CAN ID range that the card uses for communication.

Serial number: Shows the serial number of the selected card.

Replace card: Allows you to replace a card at a specific address by another one (with a different serial number). The exact procedure depends on the type of interface used to communicate with the PC.

CAN interface

When a CAN interface is used, all cards are assigned a unique CAN address. When you replace a card, the new card will get a new unique CAN address and needs to be specifically configured to act as a replacement for the old card. Follow these steps to make the replacement:

Close your application and make a backup of the configuration/settings file, where applicable.

Note the serial number of the replacement card, you will need it later.

Switch off the device, and replace the card.

Switch the device back on and load your software-configuration. Now go to the cards configuration dialog, and select the card that you replaced.

Manually type in the serial number of the replacement card, then press the 'Replace Card' button. The software should now transfer the settings of the old card to the new one.

USB or Ethernet interface

For these interfaces, cards are identified by the slot number they are placed in. This makes replacing a card easier than using the CAN interface. Follow these steps to make the replacement:

Close your application and make a backup of the configuration/settings file, where applicable.

Switch off the device, and replace the card.

Switch the device back on and load your software-configuration. Now go to the cards configuration dialog, and select the card that you replaced.

Press the 'Replace Card' button. The software should the new card in the slot and transfer the settings of the old card to the new one.

Card options: Shows the type of card and its option modules.

Firmware version: Shows the firmware version of the card.

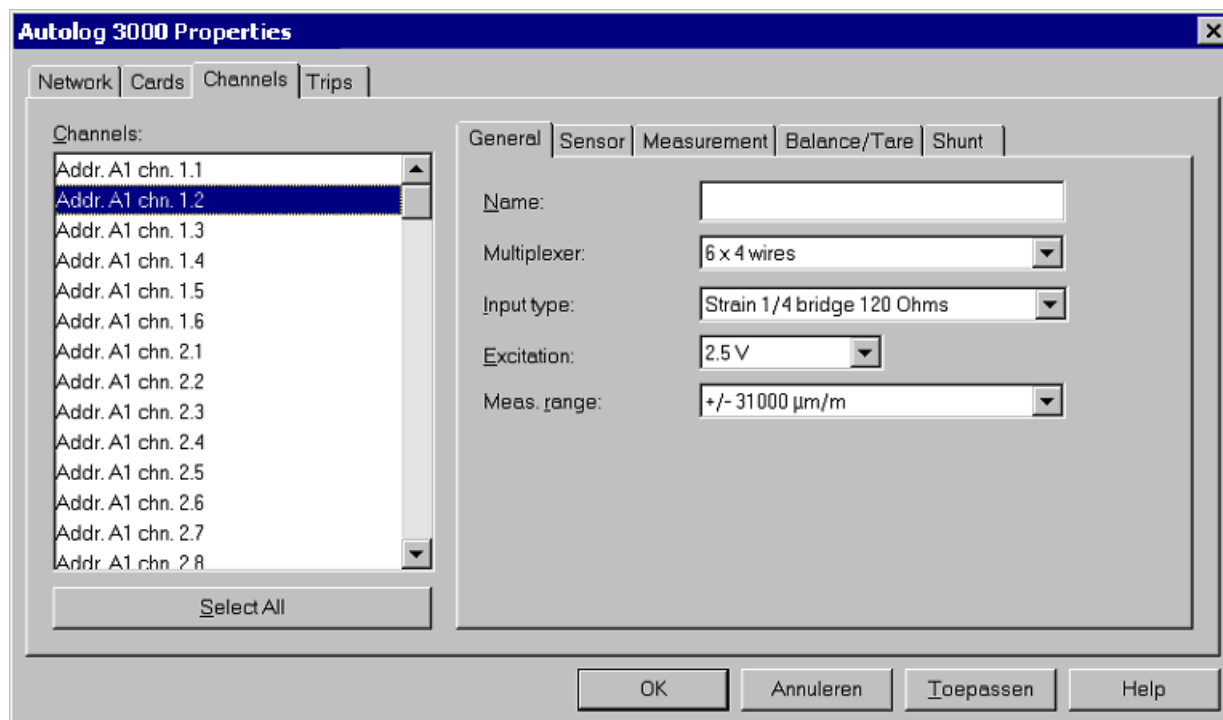
Slot number: Shows which slot number in the Autolog 3000 the card occupies.

Description: Use this description to make the card easier to identify.

Add card: Use this button to manually add a new card to the configuration. You must know and specify the serial number of the card to be able to use this function.

Remove card: Use this button to remove a specific card and all its settings from the current configuration.

8.1.4 Channels Configuration Page



Use this dialog to configure the individual channels. You can select one or more channels to configure from the list on the left side. If this list does not show any channels, go to the Network Configuration Page to configure the communication network and press the 'Scan Bus for Devices' button.

To select ranges of channels, click on the first channel, then press and hold the SHIFT key and click on the last channel. To select multiple individual channels, press and hold the CTRL key and click on the channels.

The configuration items on the right side of the dialog show the settings for the currently selected channel(s). When multiple channels are selected and an item is blank, it means that the channels have different settings for this item. When you select a new value for the item, it will apply to all selected channels.

The individual items in this configuration page described:

Channels: Using the SHIFT and CTRL keys in combination with the left mouse button, you can select one or more channels from this list to configure.

Select All: Press this button to select all available channels.

Name: Sets the name of the selected channel(s). If the same name is assigned to multiple channels, the channel names will automatically be made unique by appending a number. You can use the name to make the channels easier to identify.

Input type: Sets the type of measurement performed by the selected channel(s).

Excitation: Sets the excitation voltage as supplied to the sensor. The list of available excitation voltages depends on the type of card and its options. When measuring a 120 Ohms strain gauge using a CA3460 with option 1, beware not to set the excitation voltage higher than 2.5 V.

Meas.range: Sets the range to be used by the selected channel(s). Which ranges are available depends on the type of measurement.

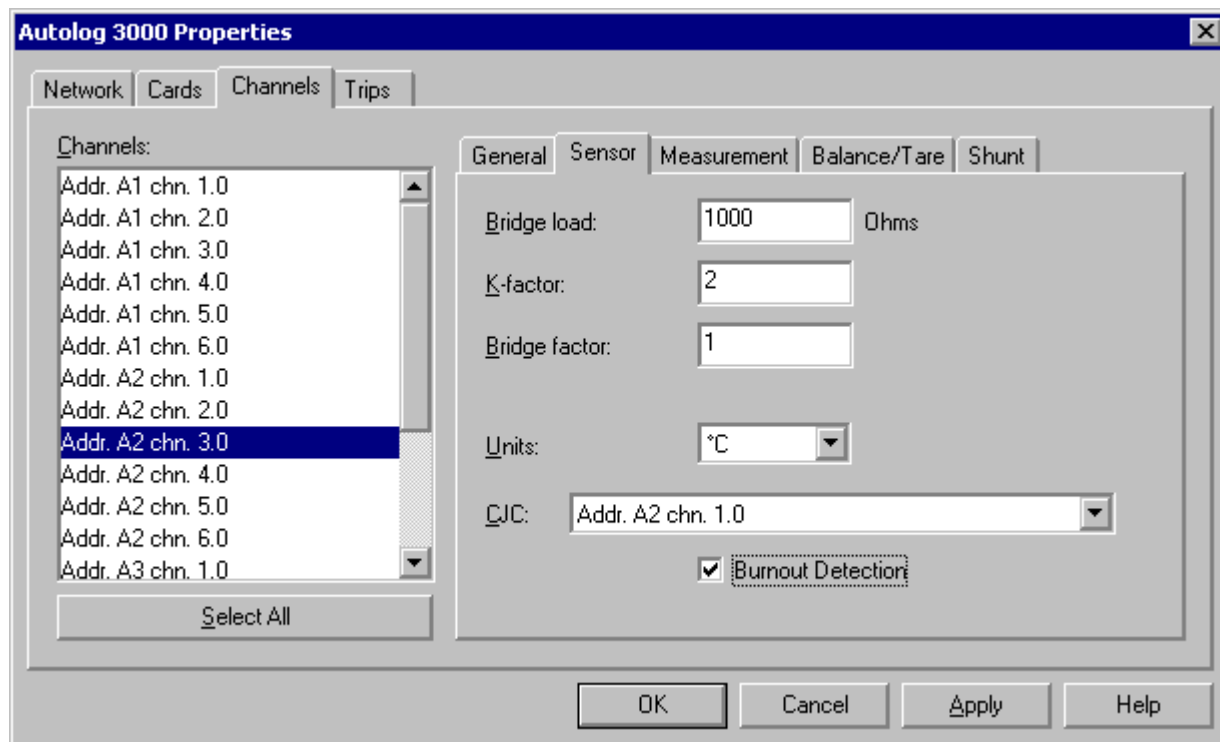
Note for S/G: the range can only be accurately calculated when the gage factor and the bridge factor on the next tab are set correctly. Please check the range setting again after making changes to those factors.

The “**Multiplexer**” setting is only available when a channel is selected which is on the CM3410 multiplexer card. The channels on this card are divided into 3 groups. For each group a selection must be made for the multiplexer. This multiplexer can handle the next type of sensor connections:

- 2 wire connection, e.g. for simple DC voltage signals
- 4 wire connection, e.g. for a potentiometer or quart bridge sensor
- 6 wire connection, e.g. for a full bridge sensor with sense lines on the excitation
- 8 wire connection, e.g. for the same full bridge sensors with sense lines and TEDS connection
- 10 x TC + 1 CJC, used for thermocouple measurements where 10 thermocouple channels can be connected in 2-wire configuration, together with a 4-wire CJC channel.

In the “**Input type**” box, only those sensors type are noted which can be measured with the selected multiplexer setting.

8.1.5 Channels Configuration: Sensor



The sensor tab page of the channel configuration contains parameters specific to strain gage, pt-100 and thermocouple measurements. Which parameters are shown depends on the type of input selected on the general tab.

Settings for strain gage and transducer measurements

Bridge load: For strain gage and transducer measurements, the sensor impedance. This value is used to determine the expected shunt measurement values. This value has no influence on normal measurements.

K-factor: For strain gage measurements, the gage factor of the strain gage element, depending on material type. The correct value can be found on the packaging of the strain gage, and is usually around 2.

Bridge factor: For strain gage measurements, the bridge factor for half and full-bridge measurements. The value indicates how many of the strain gages actively contribute to the signal. A typical example of a half-bridge S/G configuration, where the bridge factor is not equal to 2, is the use of a second S/G solely for temperature compensation. This second strain gage is usually affixed to the same material and placed near the location of the active strain gage. This so-called dummy S/G experiences the same elongation due to temperature as the active S/G (which cancels out the influence on the measured value), but no mechanical load. In this example the bridge factor would be 1.

Another example is a full-bridge S/G, where 2 S/G's are active and the other 2 are affixed at a 90° angle to the direction of the load. In this case a typical bridge factor would be 2.6.

Other examples can be found in the literature on strain gage measurements.

Settings for thermocouple and Pt-100

Note: for thermocouples it is practical to configure the CJC-channel (Pt-100) first, otherwise it will not appear in the list of available CJC points.

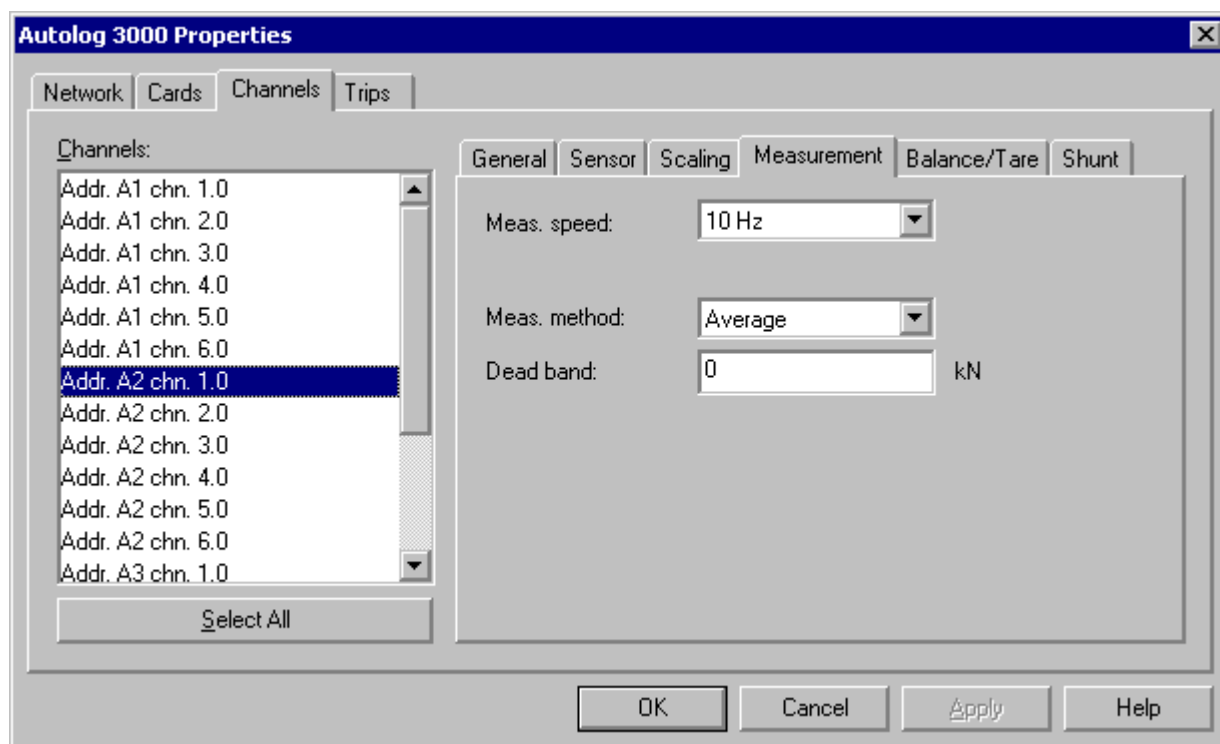
Units: Selects the presentation units for temperature measurements (Celsius, Fahrenheit or Kelvin).

CJC: For thermocouples, selects the (Pt-100) input to use for cold-junction-compensation measurement. When measuring thermocouples, the transition between the thermocouple wires and connection box (cold junction) causes thermoelectric voltages which induce a temperature-dependent error in the measurement. Therefore, this temperature must be measured in order for the firmware to compensate for this error. As a rule a Pt-100 element is used to accurately determine the temperature at the connection point. Peekel Instruments has a special CJC-11 connection box for this purpose.

Burnout detection: For thermocouples, burnout detection makes sure that a broken wire on a thermocouple measurement does not go undetected. Using this option, a broken thermocouple causes a fixed value to be shown, indicating an error. Without this, an open input can lead to an unpredictable value, which may not always clearly be recognized as an error.

Beware: for thermocouples with very high impedance (e.g. by using very long/thin cables) or IR-temperature sensors the burnout detection should be switched off, as it can lead to an inaccurate measurement value in this case.

8.1.6 Channels Configuration: Measurement



The measurement tab page of the channel configuration determines the measurement speed and related parameters.

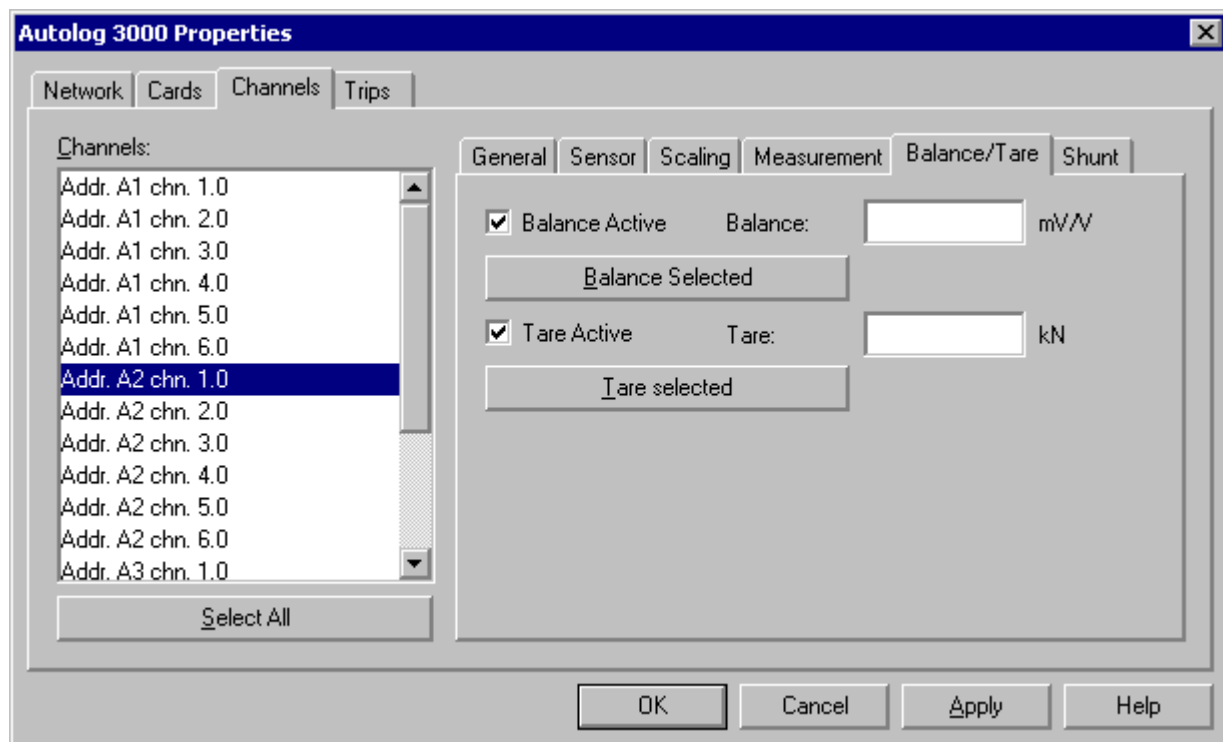
Meas. speed: The speed at which the channel should output measurement values.

Scan speed: The speed at which the card measures internally. If set to 'Auto', the optimum speed will be determined automatically. The rule is that the Scan speed is 100 Hz for measurement speeds of 100 Hz and lower or 5 Hz for measurement speeds of 5 Hz and lower. This setting is most important when using Meas. method 'Maximum' or 'Minimum'!

Meas. method: For measurement speeds lower than 1000 Hz, this setting determines what operation the hardware should perform on the raw measurement values (@ 1000 Hz) to reduce it to the requested amount of data.

Dead band: If set to 0 (default), all measured values will be output at the requested speed. Otherwise, measured values will only be output if they differ from the last output value by more than the dead band setting. Regardless of the dead band setting, at least one measurement value will be output every second.

8.1.7 Channels Configuration: Balance/Tare



The balance/tare tab page of the channel configuration contains settings and commands for balance and tare functions.

Difference between balance and tare:

Balance: the measurement value is set to 0 before conversion to physical units.

Tare: the measurement value is set to 0 after conversion to physical units.

If a scaling is used that introduces an offset, then performing a balance will not set the measured value to zero (in physical units), but to the offset.

Balance active: Determines whether or not the balance value is used for this channel.

Balance selected: Performs a balance command on the current selection of channels. This command averages the measured values over a period of 1 second to determine a stable balance value.

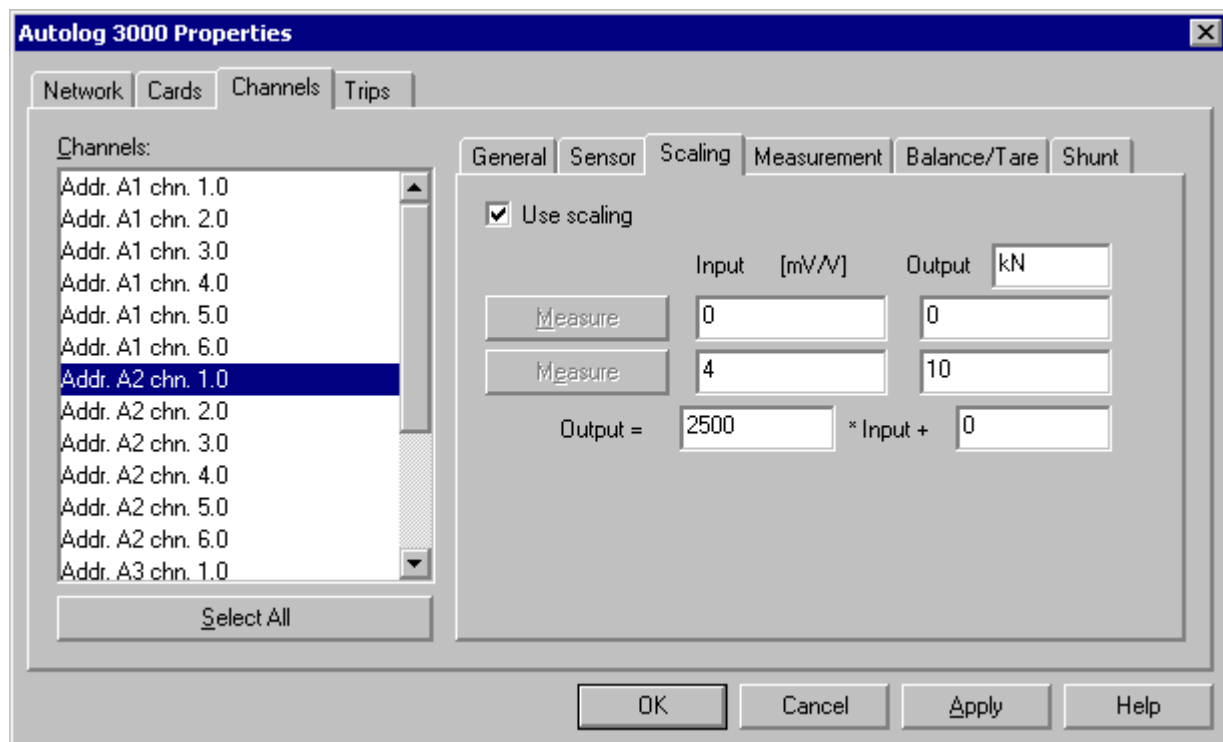
Balance value: The current balance value. It is possible to manually modify this value.

Tare active: Determines whether or not the tare value is used for this channel.

Tare selected: Performs a tare command on the current selection of channels. This command averages the measured values over a period of 1 second to determine a stable tare value.

Tare value: The current tare value. It is possible to manually modify this value.

8.1.8 Channels Configuration: Scaling



The scaling tab page of the channel configuration contains scaling parameters to allow for a linear scaling from the input value to suitable engineering units.

Use scaling: Determines whether or not linear scaling is used.

Output units: Freely assignable engineering units in which the result of the linear scaling is expressed.

Measure: Press this button to obtain the latest measurement value for this channel as input value. You should first activate the channel and set a suitable measurement speed (slow to get a stable value) before using this function.

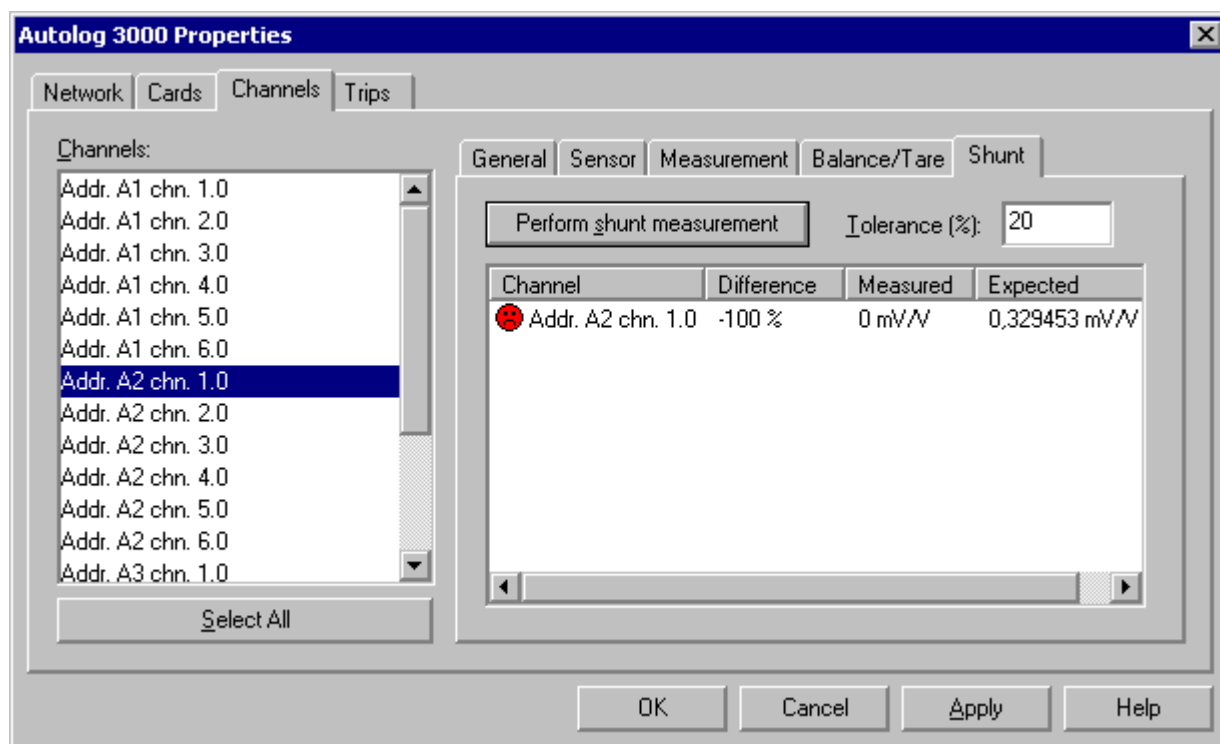
Note: this function is used to measure the range of sensors. To do this, the sensor should be supplied to two different known values and measured at those points. The known values should be entered by hand as output values.

Input values: You can choose two different input values for which you know the physical output value you desire.

Output values: When you change one of the output values, the new factors for scaling will be calculated and shown.

Scaling formula: The formula shows how the input values are converted to the output values. You can modify this formula to your liking.

8.1.9 Channels Configuration: Shunt



The shunt tab page of the channel configuration allows you to perform shunt measurements **for strain gage and transducer** channels on a CA3460 with option 1.

Perform shunt measurement: Press this button to perform a shunt measurement on the selected channels. A shunt measurement will only be performed for channels configured to a suitable input type (strain gage, transducer).

Shunt tolerance: Determines the maximum difference allowed between the expected and the measured value. If the difference is greater, a red smiley is shown in the measurement results.

Results: The results of a shunt measurement are shown in a list which includes the measured value in mV/V, the expected value and the difference in percent for each measured channel.

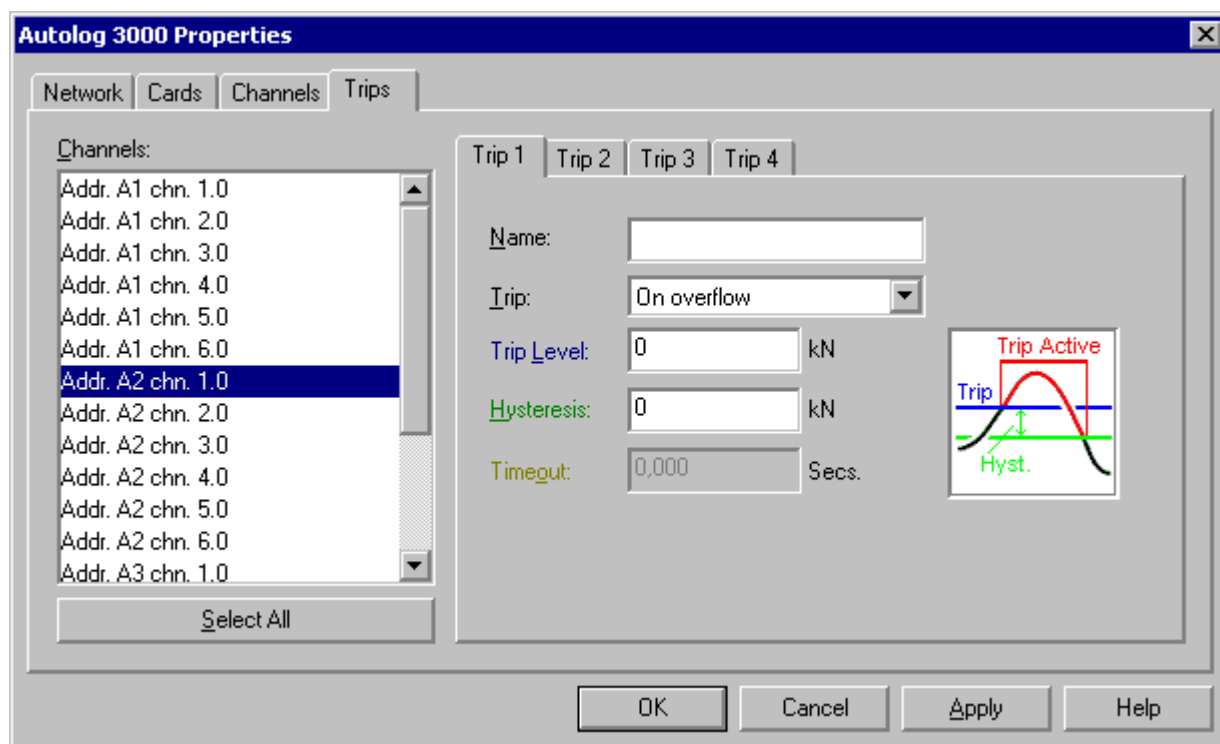
Judging the results, or, what do the red smilies mean?

Question: how high is the actual difference? Possibly the default tolerance of 20% is not enough, e.g. when very long measurement cables are used.

If the measured difference is very big, these are the things to look out for:

- Is the sensor connection correct (correct channel, correct wiring)?
- Is the configured sensor type (tab General) correct? For ¼ bridge S/G: check the resistance value!
- Is the correct bridge load entered in the tab Sensor?
- Is the measurement cabling (connection to the sensor) OK?

8.1.10 Trips Configuration Page



Use this dialog to configure up to four trips for the individual channels. You can select one or more channels to configure from the list on the left side. If this list does not show any channels, go to the Network Configuration Page to configure the communication network and press the 'Scan Bus for Devices' button.

To select ranges of channels, click on the first channel, then press and hold the SHIFT key and click on the last channel. To select multiple individual channels, press and hold the CTRL key and click on the channels.

The configuration items on the right side of the dialog show the settings for the currently selected channel(s). When multiple channels are selected and an item is blank, it means that the channels have different settings for this item. When you select a new value for the item, it will apply to all selected channels.

The individual items in this configuration page described:

Channels: Using the SHIFT and CTRL keys in combination with the left mouse button, you can select one or more channels from this list to configure.

Trips tabs: From this tab strip, you can choose between the four different trips that can be configured per channel.

Name: Set a freely configurable name for the trip.

Trip: Sets the type of trip, unused trips are marked 'disabled'. 'On overflow' trips will activate as soon as the signal exceeds the trip level and deactivate as soon as the signal drops below 'trip level - hysteresis'.

‘Retriggerable overflow’ trips will activate as soon as the signal exceeds the trip level and deactivate when the signal remains below ‘trip level - hysteresis’ for at least ‘timeout’ seconds.

Trip Level: Sets the level at which the trip should activate. The value should be entered in the units displayed to the right of the input box.

Hysteresis: Sets the hysteresis band around the trip level that determines when the trip should deactivate. The value should be entered in the units displayed to the right of the input box. It will be added to or subtracted from the trip level to find the level at which the trip will deactivate.

Timeout: Sets the timeout time in seconds for retriggerable trips.

9 Autolog 3000 Configurator

Autolog 3000 Configurator is a software package designed to configure and control measurement devices from the Autolog 3000-Series and PICAS Touch.

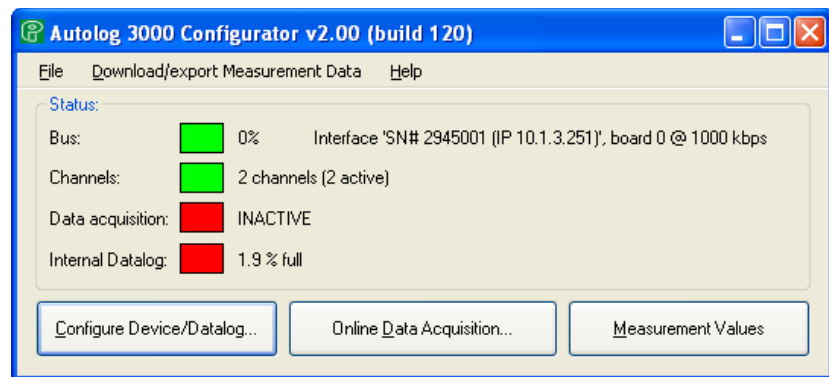
It supports the following functions:

1. Online data acquisition with simple numeric display of measurement values and ASCII file storage.
2. For devices with PB3100-processor: Configuration of stand-alone datalogging (PC independent), retrieving stored binary datalog data from the device or SD card and export in a selectable data format.

To run Autolog 3000 Configurator, you need Windows XP (Service Pack 2), Windows Vista, Windows 7 or higher.

9.1 Main Window

The main window shows the current status of the Autolog 3000 network. The status field shows the following items:



- Bus: The selected bus interface (CAN, USB or TCP/IP Ethernet). The status light is green when the interface is detected and working properly.
- Channels: The amount of channels connected to the interface. The amount of active channels shows how many channels are actually measuring data. The status light is green when at least one channel is connected to the network.
- Data acquisition: The status light is green when online data acquisition is active.
- Internal Datalog: Shows the status of the internal datalog of the device (SD card or flash memory). The status light is green when internal datalogging is active, yellow when waiting for a trigger event to start logging.

The buttons below the status field:

- Configure Device/Datalog: Use this button to configure the device and/or internal datalogging.
- Online Data Acquisition: Use this button to activate online data acquisition and logging of measurement data to disk.
- Measurement Values: Use this button to show a window containing the actual values for all connected channels.

9.2 File Menu Commands

The File menu offers the following commands:

Open:

Use this command to open an existing configuration.

Save:

Use this command to save the active configuration to its current name and directory. When you save a configuration for the first time, Autolog 3000 Configurator displays the Save As dialog box so you can name your configuration. If you want to change the name and directory of an existing configuration before you save it, choose the Save As command.

Save As:

Use this command to save and name the active configuration. Autolog 3000 Configurator displays the Save As dialog box so you can name your configuration.

Language command:

Use this command to select one of the three available languages for Autolog 3000 Configurator. After selecting a new language, Autolog 3000 Configurator will immediately update itself accordingly.

Recent Files:

Use the filenames listed at the bottom of the File menu to open the last four configurations you closed. Choose the number that corresponds with the configuration you want to open.

Exit:

Use this command to end your Autolog 3000 Configurator session. You can also use the Close command on the application Control menu. Autolog 3000 Configurator prompts you to save configurations with unsaved changes.

9.3 Download/export Measurement Data

The "Download/export Measurement Data" menu offers the following commands:

Download Data from Device:

Downloads data from the internal memory of a connected device with PB3100 communication card.

Export Data from SD Card:

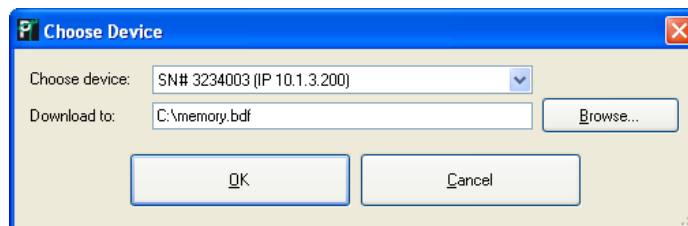
Convert datalog data stored on an SD card for use with external software.

Export Data from Downloaded .BDF File:

Convert datalog data from a .BDF file downloaded from the PB3100 at an earlier time.

9.3.1 Download Data from Device

When downloading data from the internal memory of the PB3100 communication card, a binary file with extension .bdf (binary data file) will be created on the PC. This file contains data in a proprietary format that can be converted to ASCII or other common formats using the Export Measurement Data function

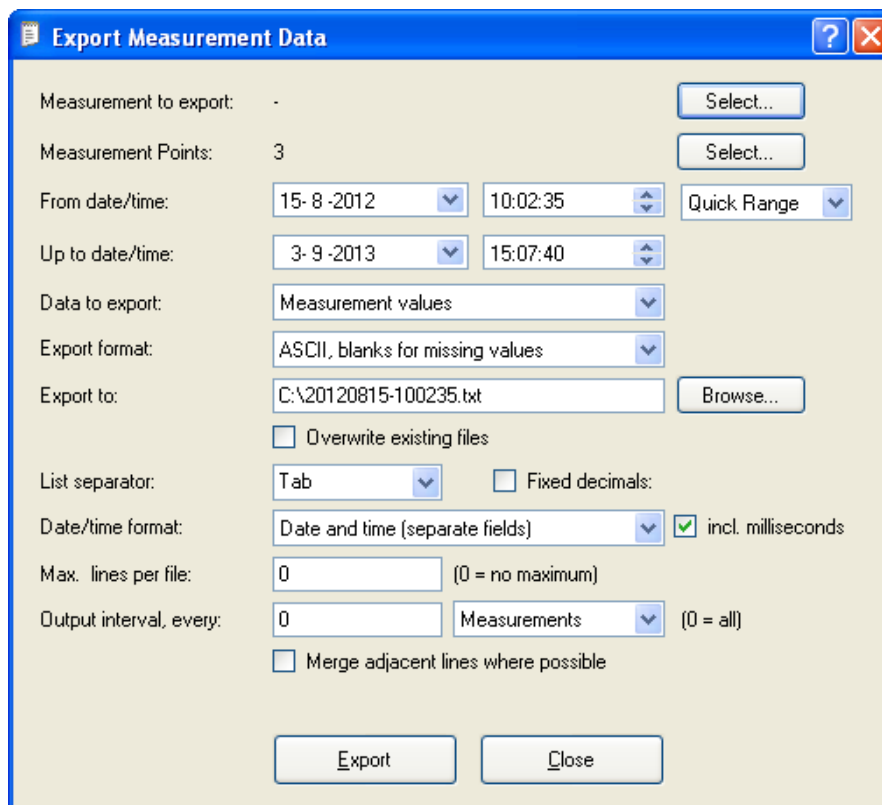


9.3.2 Export Measurement Data

A dialog will show, which allows you to select which data you want to export and what the exported file should look like.

The first line shows the period of time over which measurement data should be exported. Click the 'select' button next to it to select a specific historic measurement.

The second line shows how many measurement points are selected for export. Click the 'select' button next to it to make a specific selection of measurement points.



You can manually select a specific time range to export using the 'from date/time' and 'upto date/time' fields, or make a 'Quick Range' selection to retrieve a recent measurement.

You can choose the file name to export to or 'browse' for a suitable location. If the 'overwrite existing files' is not checked, a sequence number will automatically be appended to the file name and increased to make sure no existing file gets overwritten.

The export format can be ASCII (to file or to clipboard), DIAdem, a list-based format or Matlab .MAT (level 4). ASCII files are tab-separated by default, making it easy to read them in e.g. Excel. DIAdem output consists of 2 files: 1 ASCII file (extension .DAT) describing the format and 1 binary file (extension .R32) containing the measurement values. List files contain a single line for each measurement value, and are not suitable for high volumes of measurement data.

When you choose to export ASCII data directly to clipboard, you are limited to a maximum of 100 measurement points and 30,000 lines of measurement data. Using 'tab' as separator, ASCII data on the clipboard can easily be pasted to applications like Excel.

If you set a 'max. lines per file' the export will create multiple files with increasing sequence numbers as needed to make sure each file does not contain more than the specified amount of lines.

The 'output interval' can be used to reduce the amount of data retrieved by e.g. only exporting 1 value out of every 10, or exporting 1 value per minute.

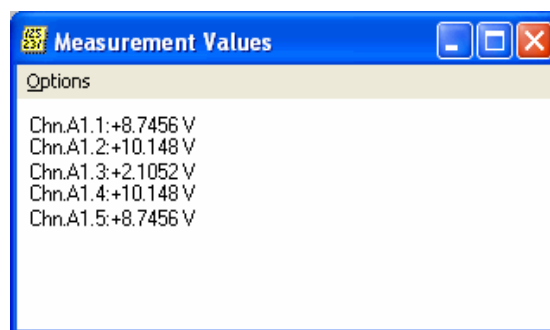
If you check the 'merge adjacent lines where possible' setting, the export routine will try to merge as many values as possible onto a single line, even if they do not have the same time stamp. This helps to combine data from different sources (devices) that do not supply data for the same measurement at the exact same time.

9.4 Measurement Values

The 'Measurement Values' window shows the current measurement values for all active channels.

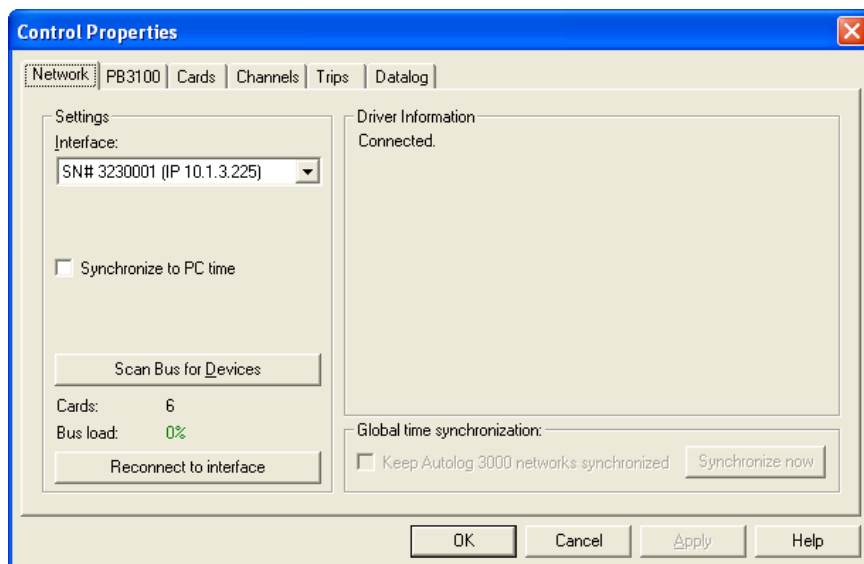
The 'Options' menu has the following items:

1. Font: Allows you to select a different font (both for display and printing)
2. Print: Allows you to print the contents of the current window (exact copy of the window on screen).
3. Copy to Clipboard: Allows you to copy the current measurement value to clipboard. The values are copied as tab-separated text, suitable for pasting in a spreadsheet like Excel.



9.5 Configuration

The device configuration dialog shows six pages, which can be used to configure the Autolog 3000 / PICAS Touch device and the internal datalogging, where applicable.



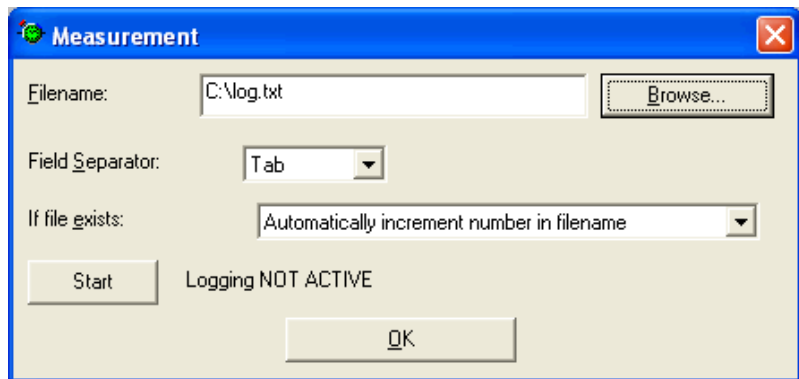
- Network: Configures the communication interface.
- PB3100: Configures settings specific to the PB3100 communication card.
- Cards: Configures the individual CA3460 cards.
- Channels: Configures the individual channels of the Autolog 3000 device.
- Trips: Configures trip levels for individual channels.
- Datalog: Configures internal datalogging for the PB3100 communication card.

9.6 Online Data Acquisition

The online data acquisition configuration dialog allows you to choose a file, in which measurement values will be stored. Measurement data will be stored in ASCII format, using the field separator specified.

When logging starts and the selected file already exists, you can specify what action should be taken.

The 'start' button will activate the logging. While logging is active, you will not be able to alter the settings.



10 Autosoft 3000

Autosoft 3000 is a advanced software package designed to configure and control Autolog and Unilog data acquisition systems. It can control multiple AUTOLOG 3000, PICAS Touch, Autolog 2005, Autolog 2100 and/or Unilog 2500 devices with BASE controller connected to the same PC.

To measure data using Autosoft 3000, first configure one or more measurement devices. After that, create channels to measure. Depending on the hardware, Autosoft 3000 can measure DC Voltage, Thermocouples, Pt-100, Strain gauges, Transducers, LVDT's and Digital Inputs and Outputs.

In addition, you can create Rosette channels for combinations of two or three strain gages. Virtual channels allow you to perform complex calculations on the measured data on-line.

After your devices and channels are configured, you can create measurement groups in which you can place any collection of channels to be measured. Numerical groups allow you to show measurement data on screen in numerical form, and also store measured data. Online graphics are supported using graphical groups, which can show up to 16 channels in a single graphical display.

In addition to all of this, Autosoft 3000 also supports autobalance measurements, alarms (which can not only be displayed, but can also trigger output relays and the start or stop of measurements) and the manual setting of output channels.

A free 30-trial trial can be downloaded from www.peekel.com. For more information, refer to the Autosoft 3000 Manual.

11 Card communication

The communication with the CA3460 must be done through the CAN bus. For this communication a CAN bus ID is required. The CA3460 ID must be set through the CAN bus communication.

The CAN ID's used on the bus are standard 11 bits long.

Via a special command, the serial number of the CA3460 card together with its CAN ID are sent on the CAN Bus. Every unit will receive this message. The CA3460 card with the corresponding serial number will take over the CAN ID, and answer the message.

Each channel has its own two CAN ID's.

1 CAN ID is used for the actual measurement value.

The other CAN ID is used for other commands, like channel configuration.

The CA3460 card will receive 1 CAN ID during configuration.

This CAN ID will be called Card ID.

channel nr	description	CAN ID
01	meas value	Card ID
	commands	Card ID +1
02	meas value	Card ID +2
	commands	Card ID +3
03	meas value	Card ID +4
	commands	Card ID +5
04	meas value	Card ID +6
	commands	Card ID +7
05	meas value	Card ID +8
	commands	Card ID +9
06	meas value	Card ID +10
	commands	Card ID +11

The first channel is addressed by the Card ID and Card ID+1, and the second channel is addressed by the card ID+2 and Card ID+3, and so on.

11.1 CA3460 DC direct input card

Each type of card has a basic number of channels, each with a number of multiplex count.

Card type	Number of base channels	Numer of multiplex channels for each base channel
CA3460	6	0
CM3410	3	3,4,6 or 12
CD3733	2	16

The number of multiplexer channels on the CM3410 depends on the wire connection selected for the base channel.

The configuration of the CD3733 is a bit different. For clarity this is described in a separate chapter.

Each of the channels must be configured.

Each channel configuration has 4 bytes.

Information sent to the cards is done on a command basis. The first data byte holds the command.

The following commands can be given:

nr	description	
01	Set channel configuration	command content (6 bytes): 1 st byte: 01 (command) 2 nd byte: multiplexer channel nr, 0 for CA3460 3 rd – 6 th byte contain the channel settings response: no response
02	Get channel configuration When this command is sent to CAN ID 0, all the CA3460 cards will send the configuration of each channel	command content (1 byte): 1 st byte: 02 (command) response: 1 message for each configured channel (7 bytes): 1 st byte: 02 (command) 2 nd byte: card type, CA3460 = 0x40, CA3410 = 0x41 3 rd byte: multiplexer channel nr, 0 for CA3460 4 th - 7 th byte: configuration of the channel
03	Get card serial number When this command is sent to CAN ID 0, all the CA3460 cards will respond	command content (8 byte): 1 st byte: 03 (command) response (7 bytes): 1 st byte: 03 (command) 2 nd -5 th byte: card serial number 6 th byte: card slot number (0-14 = slot number in rack, 15 = card not placed in a rack) 7 th byte: card options, defined hex codes: 00h = version 1 base card 11h = version 2 base card 12h = S/G option for channels 1-3 21h = S/G option for channels 4-6 22h = S/G option for all channels

		33h = LVDT option for all channels Other option combinations are also possible, i.e. 13h LVDT option for channels 1-3 etc. 8th byte: card type, CA3460 = 0x40, CA3410 = 0x41
04	Set device CAN ID	command content (7 bytes): 1st byte: 04 (command) 2nd-5th byte: CA3460 serial number to set CAN ID for 6th-7th byte: CAN ID to assign to the card response: no response
06	Do special measurement	command content (5 bytes): 1st byte: 06 (command) 2nd byte: multiplexer channel nr, 0 for CA3460 3rd byte: 01 = balance measurement 02 = tare measurement 03 = shunt measurement (bridge type only) 07 = read sensor ID 4th-5th byte: number of milliseconds for the duration of the required measurement. The requested measurement will be executed. The value will be sent as a measurement value, only the 3 high bits in the channel number will hold the above mentioned code.
07	Get special measurement	command content (3 bytes): 1st byte: 07 (command) 2nd byte: multiplexer channel nr, 0 for CA3460 3rd byte: 01 = balance measurement 02 = tare measurement 03 = shunt measurement 04 = dead band value 05 = low peak value 06 = high peak value 07 = return sensor ID in The requested measurement will not be executed. response (7 bytes): 1st-3rd byte: identical to the command sent 4th-7th byte: the requested value (floating point)
08	Set special measurement	command content (3 bytes): 1st byte: 08 (command) 2nd byte: multiplexer channel nr, 0 for CA3460 3rd byte: 01 = balance measurement 02 = tare measurement 04 = dead band value 4th-7th byte: value of measurement response: no response
09	Set CJC channel	command content (3 bytes): 1st byte: 09 (command) 2nd-3rd byte: CAN id for CJC value 5 MSB holds multiplexer channel number 11 LSB holds the 11 bit CAN ID
10	Peak value measurement	command content (3 bytes):

		1 st byte: 10 (command) 2 nd byte: multiplexer channel nr, 0 for CA3460 3 rd byte: 00 = stop peak value measurement 01 = activate peak value measurement The peak value measurement will be executed on each measured value (1000 time each second). No extra filtering will be done on the signal. When a new min or max value is detected, it will be sent immediately.
19	Perform synchronization	command content (1 byte): 1 st byte: 19 (command) response: no response
20	Get firmware version	command content (1 byte): 1 st byte: 20 (command) response (5 bytes): 1 st byte: 20 (command) 2 nd -5 th byte: firmware version (integer value, i.e. 116 = v1.16)

Note:

The special measurements “Balance, Tare and Shunt” are floating point numbers and in the unit input voltages [V] or [V/V] for bridge measurements.

When a dead band value is sent to the card, the actual measurement will be sent every second. This is a value according to the selected measurement method and measurement speed. When the value has changed more than the dead band value since the last transmitted value, it will be sent immediately.

11.1.1 Communication control

17	Resume communication	command content (1byte): 1 st byte: 17 (command) response: no response
18	Stop communication	command content (1byte): 1 st byte: 18 (command) response: no response

With these commands the sending of the measured values from the USB controller in the Autolog 3000 system is stopped or resumed. This USB controller will send all the measured values from the input cards directly to the PC through the USB connection. This communication will be almost continuously. When the software on the PC wants to stop/start this communication it has to send the appropriated command

11.1.2 Channel configuration bytes.

The first byte

The first configuration byte holds the following information:

Bit nr	description	
Bit 0 :	Measurement type	Read/write see Measurement type table
Bit 1 :	Measurement type	Read/write see Measurement type table
Bit 2 :	Measurement type	Read/write see Measurement type table
Bit 3 :	Measurement type	Read/write see Measurement type table
Bit 4 :	Measurement type	Read/write see Measurement type table
Bit 5 :	Measurement range	Read/write see Measurement range table
Bit 6 :	Measurement range	Read/write see Measurement range table
Bit 7 :	On board buffer	0 = cycle, at overflow remove oldest values 1 = full, at overflow stop buffer function

Measurement type table:

Type. setting	Description
00000	off
00001	Voltage
00010	Current
00011	Potmeter measurement
00100	PT100 temperature
00101	Full bridge
00110	Half bridge
00111	Quarter bridge 120 Ω
01000	Quarter bridge 350 Ω
01001	Quarter bridge 1K Ω
01010	TC type B
01011	TC type E
01100	TC type J
01101	TC type K
01110	TC type N
01111	TC type R
10000	TC type S
10001	TC type T
10010	Full bridge
10011	Resistor
10100	LVDT Full bridge
10101	LVDT Half bridge

Measurement range table:

Range setting	00	01	10
Voltage	-10V - +10V	-2V - +2V	-40mV - +40mV
Current	-	- 50 mA - + 50 mA	-
Potmeter		-0 – 100 %	-
PT100 temp.	-		
Full bridge	-		
Half bridge	-		
Quarter bridge	-		
TC type B	-	-	+250 - + 1820 °C
TC type E	-	-	-200 - + 1000 °C
TC type J	-	-	-200 - + 1200 °C
TC type K	-	-	-200 - + 1370 °C
TC type N	-	-	-200 - + 1300 °C
TC type R	-	-	- 50 - + 1760 °C
TC type S	-	-	- 50 - + 1760 °C
TC type T	-	-	- 50 - + 400 °C
Resistor		0-4000 ohm	
LVDT full bridge	+/- 0.5V/V	+/-0.1V/V	
LVDT half bridge	+/- 0.5V/V	+/-0.1V/V	

The second byte

The second configuration byte holds the following information:

Bit nr	description	
0	Measurement speed	Read/write see Measurement speed table
1	Measurement speed	Read/write see Measurement speed table
2	Measurement speed	Read/write see Measurement speed table
3	Measurement speed	Read/write see Measurement speed table
4	Thermocouple burn out detection	0 = off 1 = on
5	Auto send after measurement	0 = off 1 = on
6	Measurement method	Read/write see Measurement method table
7	Measurement method	Read/write see Measurement method table

Measurement speed table:

Speed setting	Speed
0000	off
0001	1 Hz
0010	5 Hz
0011	10 Hz
0100	25 Hz
0101	50 Hz
0110	100 Hz
0111	250 Hz
1000	500 Hz
1001	1000 Hz

Measurement method table:

method setting	method	
00	average value	
01	maximum value	
10	minimum value	
11	min & max value	not implemented yet

The third byte

The third configuration byte holds the following information:

Bit nr	description	
0	Excitation voltage	Read/write see Excitation table
1	Excitation voltage	Read/write see Excitation table
2	Excitation voltage	Read/write see Excitation table
3	Excitation voltage	Read/write see Excitation table
4	Excitation voltage	Read/write see Excitation table
5	Excitation voltage	Read/write see Excitation table
6	Auto send after measurement	0 = off 1 = on , also after power up
7	Sensor ID	0 = not used, 1 = used

Excitation voltage table:

Speed setting	Voltage
00000	off = 0V
00001	0.5V
00010	1 V
00011	1.5 V
00100	2 V
00101	2.5 V
00110	3 V
00111	3.5 V
01000	4 V
01001	4.5 V
01010	5V

The maximum value of the excitation voltage depends on the impedance of the bridge, and will be:

bridge impedance	max excitation voltage
< 120 Ω	2.5V
>120 Ω & >240 Ω	5V

The card will measure the excitation current. If this current is too high, the excitation will be switched off.

All the settings are stored in FLASH memory

The fourth byte

The fourth configuration byte holds the following information:

Bit nr	description	
0	scan speed	See Scan speed table
1	scan speed	See Scan speed table
2	multiplexer setting	See Multiplexer table
3	multiplexer setting	See Multiplexer table
4	multiplexer setting	See Multiplexer table
5	reserved	0
6	reserved	0
7	reserved	0

Scan speed table:

Scan speed	description
00	automatic (match measurement speed)
01	5 Hz
10	100 Hz
11	1000 Hz

Multiplexer table:

Multiplexer	description
000	12 x 2 wires
001	6 x 4 wires
010	4 x 6 wires
011	3 x 8 wires
100	10 x 2 + 1 x 4 wires (TC+CJC)

11.1.3 Data from the CA3460 through CAN bus

Measured values are sent by the CA3460 in the following data format:

Length: 8 bytes

Byte 0: bit 4...0 contain the multiplexer number (0 for CA3460)

bit 7, 6 & 5 identifies the value type:

000 = actual measurement value

001 = balance measurement

002 = tare measurement

003 = shunt measurement (bridge type only)

004 = minimal peak value

005 = maximum peak value

006 = not used yet

007 = sensor ID

Byte 1, 2, 3: measure index. This index is increased every 1 msec.

Byte 4, 5, 6, 7: channel value in floating point format (byte 4 = MSB)

The first channel sends its data with the card ID.

The second channel sends its data with the card ID+2, and so on

11.2 CA3410 Multiplexer card

The CA3410 multiplexer card uses the same command set as the CA3460. The channels are divided into 3 groups, each containing up to 12 multiplexer channels. Depending on the channel configuration, the channel uses 1, 2, 3 or 4 pairs or wires of the total amount available (3 x 12 pairs).

Example configuration of 2-wire channels:

1st channel: channel 0, multiplexer 0

2nd channel: channel 0, multiplexer 1

3rd channel: channel 0, multiplexer 2

...

12th channel: channel 0, multiplexer 11

13th channel: channel 1, multiplexer 0

...

Example configuration of 6-wire channels:

1st channel: channel 0, multiplexer 0

2nd channel: channel 0, multiplexer 3

3rd channel: channel 0, multiplexer 6

4th channel: channel 0, multiplexer 9

5th channel: channel 1, multiplexer 0

11.3 CD3733 Digital I/O card

The digital I/O card has 16 inputs and 14 outputs. For configuration purposes, the set of 16 inputs is addressed as a single channel (channel 0) with 16 bits representing the individual inputs.

Likewise, the 14 outputs are addressed as channel 1.

The following commands can be given:

nr	description	
01	Set channel configuration	command content (3 bytes): 1 st byte: 01 (command) 2 nd byte: 00 (multiplexer channel nr) 3 rd – 6 th byte contain the channel settings response: no response
02	Get channel configuration When this command is sent to CAN ID 0, all the cards will send the configuration of each channel	command content (1 byte): 1 st byte: 02 (command) response: 1 message for each configured channel (7 bytes): 1 st byte: 02 (command) 2 nd byte: digital I/O type, standard = 0x50 3 rd byte: 00 (multiplexer channel nr) 4 th - 7 th byte: configuration of the channel
03	Get card serial number When this command is sent to CAN ID 0, all the cards will respond	command content (1 byte): 1 st byte: 03 (command) response (8 bytes): 1 st byte: 03 (command) 2 nd -5 th byte: card serial number 6 th byte: card slot number (0-14 = slot number in rack, 15 = card not placed in a rack) 7 th byte: 00 (card options) 8 th byte: 0x50 (card type)
04	Set device CAN ID	command content (7 bytes): 1 st byte: 04 (command) 2 nd -5 th byte: Card serial number to set CAN ID for 6 th -7 th byte: CAN ID to assign to the card response: no response
16	Set outputs	command content (7 bytes): 1 st byte: 16 (command) 2 nd -4 th byte: Values of the outputs to set (18 bits) 5 th -7 th byte: Mask of the outputs to set (18 bits, change only outputs whose bit is set in this mask)
19	Perform synchronization	command content (1 byte): 1 st byte: 19 (command) response: no response
20	Get firmware version	command content (1 byte): 1 st byte: 20 (command) response (5 bytes): 1 st byte: 20 (command) 2 nd -5 th byte: firmware version (integer value, i.e. 116 = v1.16)

11.3.1 Channel configuration bytes

First byte: 0 (reserved)

Second byte:

Measurement speed: If set, the values of the inputs or outputs are sent at the specified speed, regardless of state change.

Auto send: If set, the values of the inputs or outputs are sent as soon as a change occurs.

Bit nr	description	
0	Measurement speed	Read/write see Measurement speed table
1	Measurement speed	Read/write see Measurement speed table
2	Measurement speed	Read/write see Measurement speed table
3	Measurement speed	Read/write see Measurement speed table
4	reserved	0
5	Auto send after change	0 = off 1 = on
6	reserved	0
7	reserved	0

Measurement speed table:

Speed setting	Speed
0000	off
0001	1 Hz
0010	5 Hz
0011	10 Hz
0100	25 Hz
0101	50 Hz
0110	100 Hz
0111	250 Hz
1000	500 Hz
1001	1000 Hz

Third byte: 0 (reserved)

Fourth byte: 0 (reserved)

11.3.2 Data from the digital I/O card through CAN bus

Measured values are sent by the card in the following data format:

Length: 8 bytes

Byte 0: bit 4...0 contain the multiplexer number (always 0)

bit 7, 6 & 5 identifies the value type:

000 = values of all channels (bitfield)

001 = value of a single channel

Byte 1, 2, 3: measure index. This index is increased every 1 msec.

If all channels are sent:

Byte 4, 5, 6: channel values in bitfield (18 bits)

Byte 7: unused (always 0)

If a single channel is sent:

Byte 4: I/O index (0...17)

Byte 5: value (0 or 1)

Byte 6, 7: unused (always 0)

The input channels send their data with the card ID.

The output channels send their data with the card ID+2

12 Recommended CAN bus cable

The following cable is specially developed for CANBUS communication. It combines the communication and power conductors in 1 cable.

Make: Belden

Type: 3082A

ELECTRICAL CHARACTERISTICS:	

MAX. OPERATING VOLTAGE:	300 V UL PLTC, CMG
MAX. OPERATING VOLTAGE:	300 V C(UL) AWM
MAX. OPERATING VOLTAGE:	600 V UL AWM
MAX CURRENT/CONDR @ 25C (18 AWG):	5 A
MAX CURRENT/CONDR @ 25C (15 AWG):	8 A
NOM. CAPACITANCE BETWEEN CONDUCTORS OF DATA PAIR @ 1 MHZ:	12 PF/FT.
NOM. IMPEDANCE (DATA PAIR ONLY):	120 OHMS+/-12 OHMS
MAX. DELAY (DATA PAIR ONLY):	1.36 ns/FT
MIN. VELOCITY OF PROPAGATION (DATA PAIR ONLY):	75%
MAX. ATTENUATION (DATA PAIR ONLY):	
@ 125 KHZ:	.13 DB/100 FT
@ 500 KHZ:	.25 DB/100 FT
@ 1 MHZ:	.36 DB/100 FT
MAX. CONDUCTOR DC RESISTANCE @ 20 DEG C (18 AWG)	6.92 OHMS/1000 FT
MAX. CONDUCTOR DC RESISTANCE @ 20 DEG C (15 AWG)	3.60 OHMS/1000 FT
NOM. SHIELD DC RESISTANCE @ 20 DEG. C	1.8 OHMS/1000 FT.
NOM. LOOP INDUCTANCE (15 AWG)	.174 MICROHENRIES/FT
(18 AWG)	.258 MICROHENRIES/FT

Note: in less critical situations, a cheaper cable, like LIYCY 2x2x0.35, might be used. Always use different twisted pairs for communication and power lines. An overall screen, which must be connected to earth at only 1 side, is always recommended.

12.1 Bus speed versus measure interval

CAN bus speed	Maximum cable length	Measurement speed			
		1000 Hz	100 Hz	10 Hz	1 Hz
1000 kbit /s	30 m	7 channels	70 channels	192 channels	192 channels
800 kbit/s	50 m	5 channels	56 channels	192 channels	192 channels
500 kbit /s	100 m	3 channels	35 channels	192 channels	192 channels
250 kbit /s	250 m	2 channels	17 channels	175 channels	192 channels
125 kbit /s	500 m	-	8 channels	87 channels	192 channels
50 kbit /s	1000 m	-	3 channels	35 channels	192 channels
20 kbit /s	2500 m	-	1 channels	14 channels	140 channels

13 Specifications

13.1 CA3460 Specifications

For each of the 6 amplifiers and A/D converters on each card:

- Typical accuracy: 0.1% @1kHz
0.02% @ 10Hz
- Bandwidth (-3dB): 200 Hz
- Sample rate: 1000 samples/second
- 24-bit A/D converter

Input signals:

- Voltage $\pm 40\text{mV}$, $\pm 2\text{V}$, $\pm 10\text{V}$
- Current $\pm 50\text{mA}$
input resistance 70Ω
- Potentiometer sensors
output in 0 – 100%
- Thermocouples
 - Type B +250 - +1820 °C
 - Type E -200 - +1200 °C
 - Type J -200 - +1200 °C
 - Type K -200 - +1370 °C
 - Type N -200 - +1370 °C
 - Type R -50 - +1760 °C
 - Type S -50 - +1760 °C
 - Type T -50 - +390 °C
- PT100 sensors: -200°C - +500 °C
- Resistor sensors: 0 – 4000 Ω

Bridge/Sensor supply:

- Fixed 2,5VDC
- Voltage accuracy: 1 %
- Min. permissible load: 60Ω

Strain Gauge input (option 1):

- Full bridge
- Half bridge
- Quarter bridge 120Ω , 350Ω or 1000Ω (4-wire)
- Meas. ranges $\pm 8\text{ mV/V}$, $\pm 400\text{ mV/V}$ @5V
- Internal shunt resistor to check external bridge connections
- Sense technology (6-wire)
- Voltage: 0,5 - 5 VDC (in steps of 0.5V)
- Min. permissible load: 120Ω @ 5V
 60Ω @ 2.5V

LVDT input (option 2)

- Full bridge
- Half bridge
- Excitation: 4Vrms – 5kHz
- Input ranges: 100 mV/V & 500 mV/V

Further details:

- 16 bit microcontroller
- CAN communication
max 1 Mbit/sec.
- Local SPI bus:
max 5 Mbit/sec.
- Operating temperature:
-25° C.. +60 °C
- Dimensions:
Board: 191 x 145 mm
Front: 25 x 173 mm

Power supply:

- 9 – 36VDC 12VA

Sensor ID functions are not implemented yet

13.2 CM3410 Specifications

For the amplifiers and A/D converter on this card:

- Typical accuracy: 0.1%
- Bandwidth (-3dB): 200 Hz
- Max sample rate: 200 samples/second
- 24-bit A/D converter

Input signals:

- Voltage $\pm 40\text{mV}$, $\pm 2\text{V}$, $\pm 10\text{V}$
- Potentiometer sensors
output in 0 – 100%
- Thermocouples
 - Type B +250 - +1820 °C
 - Type E -200 - +1200 °C
 - Type J -200 - +1200 °C
 - Type K -200 - +1370 °C
 - Type N -200 - +1370 °C
 - Type R -50 - +1760 °C
 - Type S -50 - +1760 °C
 - Type T -50 - +390 °C
- PT100 sensors: -200°C - +500°C
- Resistor sensors: 0 – 4000 Ω

Strain Gauge input:

- Full bridge
- Half bridge
- Quarter bridge 120 Ω , 350 Ω or 1000 Ω (4-wire)
- Meas. ranges $\pm 8\text{ mV/V}$, $\pm 400\text{ mV/V}$ @5V
- Internal shunt resistor to check
external bridge connections
- Sense technology (6-wire)
- Voltage: 0.5 - 4 VDC (in steps of 0.5V)
- Min. permissible load: 120 Ω @ 5V
60 Ω @ 2.5V

Further details:

- 16 bit microcontroller
- CAN communication
max 1 Mbit/sec.
- Local SPI bus:
max 5 Mbit/sec.
- Operating temperature:
-25°C.. +60 °C
- Dimensions:
Board: 191 x 145 mm
Front: 25 x 173 mm

Power supply:

- 9 – 36VDC 12VA

Sensor ID functions are not implemented yet

13.3 CA3520 Specifications**General:**

Typical accuracy class	0.1%
Bandwidth (-3 dB)	2000 Hz
Maximum cable length:	500m
Sensor connection	2-, 3-, 4-, or 6-wire configurations

Bridge supply (transformer-isolated):

Supply voltage	0,5... 5V (adjustable)
Voltage accuracy	$\pm 0.05\%$
Frequency	5 kHz
Frequency accuracy	$\pm 1\%$
Load	60...1000 Ω 0,1% 1000... 3000 Ω >0,1%
Internal bridge-completion	$\frac{1}{2}$ - bridge and $\frac{1}{4}$ - bridge 120 Ω / 350 Ω

Measuring input (transformer-isolated):

Ranges (@5V excitation):	$\pm 100 \mu\text{V/V} \dots \pm 1 \text{ V/V}$
Input Filter: (High pass)	> 500 Hz
Max. Common Mode Voltage	200V
Common Mode Rejection (50 Hz)	>120 dB
Serial Mode Rejection:	>66 dB
Capacitive input overload	max.7x range permissible
Special input filtering for noise reduction	

Balance control:

R-balance	+/- 65 mV/V
C-Balance at 120 Ω bridge	up to 10 nF

Output:

Full scale voltage	+/- 10 V
Protection	long-term short circuit allowed
Maximum capacitive load	10 nF
Maximum cable length	100 m (@100 pF/m)
Frequency (-3 dB)	< 2000 Hz
Filter type	7-pole low pass Butter worth -42 dB/Octave

Sensor ID functions are not implemented yet

13.4 CD3733 Specifications

Digital input signals:

- 16 inputs:
- Opto-isolated
- Input current 4 mA
- Input voltage max 36 VDC
- Switching threshold > 6V

Solid state Output signals:

- 12 digital outputs:
 - Output current max 1A
 - Output voltage max 48VDC
 - Resistance with active output is 25 ohm
 - Normally Open contacts

Relay output signals

- 2 digital outputs:
 - Normally Open/Normally Closed contacts using a relay
 - Output current max 1A
 - Output voltage max 48VDC

Further details:

- 16 bit microcontroller
- CAN communication max 1 Mbit/sec.
- Local SPI bus: max 5 Mbit/sec.
- Operating temperature: -25° C.. +60 °C
- Dimensions:
 - Board: 191 x 145 mm
 - Front: 25 x 173 mm

Power supply:

- 9 – 36VDC 12VA

13.5 PB3100 Specifications

Connectors:

- USB interface 2.0 (Client)
- 10/100 Mbit Ethernet (RJ45 connector)
- CAN-Master interface for connecting additional measurement cards
- 2x RJ12 for synchronisation of multiple devices and for connecting and external DCF77 or GPS receiver
- 2-pins connector for external power supply 10-30 VDC

Datalogging options:

- 500 Mb internal flash memory
- Slot for SD memory card (supports SD and SDHC standard)

Operating temperature: 0-50 °C

13.6 Housings Specifications

HCA3001:

- Number of card slots: 1
- Dimensions: 215 x 245 x 48mm (W x D x H)
- Power requirements: 9-36VDC/40 W direct input
- Operation temperature: 0-50 °C

HCA3003:

- Number of card slots: 3
- Dimensions: 250 x 330 x 110mm (W x D x H)
- Power requirements: 9-36VDC/40 W direct input
- External power supply 100-240VAC/50-60Hz
(built-in power supply is optional)
- Operation temperature: 0-50 °C

HCA3008:

- Number of card slots: 8
- Dimensions: 271 x 326 x 224mm (W x D x H)
- Power requirements: 9-36VDC/100 W or
100-240VAC/50-60Hz
- Operation temperature: 0-50 °C

HCA3016:

- Number of card slots: 16
- Dimensions: 500 x 326 x 224mm (W x D x H)
- Power requirements: 9-36VDC/200 W or
100-240VAC/50-60Hz
- Operation temperature: 0-50 °C

PICAS Touch (HCA 3004-TSD):

- Number of card slots: 3 for measurement cards + 1 for PB3100

Dimensions: 254 x 304 x 139mm (W x D x H)

Power requirements: 9-36VDC/200 W or
100-240VAC/50-60Hz

Operation temperature: 0-50 °C